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VOLUME 6 NUMBER 17

OCTOBER 13, 1987

PC MAGAZINE

DESKTOP PUBLISHING

PC MAGAZINE ASSERTS: "It's Complicated and Expensive, but It's Worth It."

ELEMENTS OF GOOD DESIGN:

- *The Grid System*
- *Avoiding Page Clutter*
- *Limiting Fonts*

NEW YORK—Understanding and using the basic principles of page design and layout can prevent the production of the kind of pages that have given desktop publishing a bad name.

While following the tips offered in *PC Magazine*'s desktop publishing issue cannot guarantee design contest awards, it can ensure that your pages will not offend the eye of the reader.

Through extensive use of labeled examples, *PC Magazine*'s desktop publishing spe-

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PC MAGAZINE PICKS THE BEST HARDWARE:

- *Large-Screen Monitors*
- *Laser Printers*
- *Mice*
- *Scanners*

SAN FRANCISCO—Buying the right page composition hardware can "make you feel like you're on a 'Wheel of Fortune' shopping spree," according to *PC Magazine*'s desktop publishing experts.

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PC LABS TESTS:

- *GEM Desktop Publisher*
- *The Office Publisher*
- *PageMaker*
- *Ventura Publisher*

NEW YORK—PC-based desktop publishing is on th[illegible] attack And *PC Magazin*[illegible] the way with its latest [illegible] page composition softw[illegible] the PC. It's a thorough an[illegible] of the best page-making p[illegible] ucts out on the market today[illegible]

PC Magazine's desktop pub[illegible]lishing experts examine all the [illegible] software features and functions with an eye on design and hardware considerations to give you the most informed buying decision guide in the

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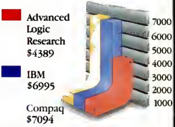

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- 80387 support
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- EMS and EEMS software
- 1.2 MB floppy disk drive
- Serial and parallel ports
- 8 expansion slots
- 101-key keyboard
- 16-MHz 80386 processor (20-MHz optional)
- 80387 support
- 32-bit Vdisk and disk caching software

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VOLUME 6 NUMBER 17

WHAT'S INSIDE

The Big Book by any measure: one spreadsheet file from editorial assistant Jennifer Zaino yielded 14 pages of features tables.

Executive editor Bill Howard has a desktop publishing Wall of Shame. On it he hangs bad examples of desktop publishing. The masterpiece is a letter, printed in red ink on a dot matrix printer, that prominently features a red photograph and seven different fonts—all with an extremely bad case of the jaggies.

While we don't know what package is responsible for this travesty, it illustrates an important point. Many products that claim to be for desktop publishing are clearly not for replicating typesetting, layout, and design. We informally call these low-end packages "The Pretenders."

In fact, there are currently only four real desktop publishing packages for the PC on the market today. By "real" we mean packages that you can edit directly in a WYSIWYG view of the page and that cost under $1,000. Why so few, despite all the hype? These packages are extremely complicated by design, having to work with numerous word processors, scanner files, and graphics files. But finally, the packages that are available are mature, full-featured products. For reviews of these packages, see "PC Desktop Publishing Comes of Age" on page 92. For tips on how to use them, see page 173, "What's Wrong with This Page?"

While few true desktop publishing packages are available, their availability has created a market for related hardware. For instance, scanners, which we review beginning on page 185 in "Scanners Take Off," have experienced phenomenal sales growth. While we found only 9 scanners to review when we covered scanners 1 year ago in Volume 5 Number 16, we review 32 of them in this issue. To inform you of their features, editorial assistant Jennifer Zaino spent days putting together a features table in *1-2-3* that ended up measuring 5 feet by 7 feet. "It's as big as my shower curtain!" Zaino exclaimed when it was all over.

If you dream of having a truly paperless office, inch one step closer by trying out CARDFILE, this issue's hot new free utility. CARDFILE, written by Jeff Prosise, is a slick memory-resident electronic Rolodex that you can pop up in the middle of any application and then enter, edit, or search for names, addresses, and numbers at the flick of a function key. It will even dial your phone. You'll love it.

And if your kids are itching to follow in your footsteps in a family (or any other) business by getting their MBA, turn to After Hours for a review of *The Official Software for GMAT Review* from the Educational Testing Services, a program that will give them a leg up on their preparations. PC

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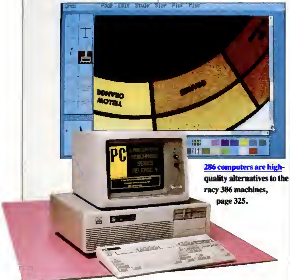
The SpectraFAX 200 Scanner gives you the ability to scan your original images in color, page 185.



286 computers are high-quality alternatives to the racy 386 machines, page 325.

COVER STORY

PC Desktop Publishing Comes of Age
Diane Burns and S. Venit/Business is booming in the PC desktop publishing market—estimated sales for 1987 have reached 50,000 packages and are expected to climb to over 300,000 in 1990. The greater availability of true WYSIWYG packages—such as *GEM Desktop Publisher*, *The Office Publisher*, *PageMaker* for the PC, and *Ventura Publisher*, all reviewed here—has spurred the increase in sales. Our look at these products and how they've matured will help you determine which of them is best suited for your application.................... 92

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Roberto Brosan

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The First Looks section is the designated entry point for all new products into the pages of *PC Magazine*. This late-closing section has a newspaperlike deadline, which allows us to review new products within a few weeks of our press date. If you have a new product, contact:
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FEATURES
The feature stories in *PC Magazine* are designed to be the most complete product evaluations in the industry. Months of planning and research go into each issue. But products can be considered for review only if we know about them, so keep the features staff informed of your latest products. Contact:
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Each issue of *PC Magazine* contains free programs, tutorials, user tips, and applications advice to help our readers gain technical proficiency. We're very interested in receiving user tips (on disk, please) and are eager to bear from assembly language programmers who can help us develop useful *PC Magazine* utilities. Unfortunately, because of the large volume of mail, we can't acknowledge or respond to all submissions. Contact:
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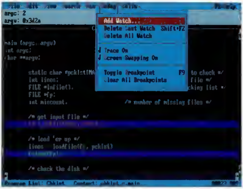

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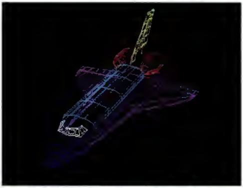

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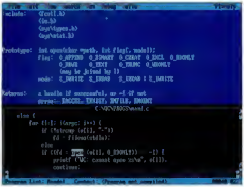

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Microsoft QuickC Compiler Feature Comparison

	Microsoft QuickC Version 1.0	Turbo C® Version 1.0
Debugger		
Integrated debugger and editor	Yes	—
Source-level debugging	Yes	—
Watch local & global variables	Yes	—
Set breakpoints	Yes	—
Stack tracing	Yes	—
Editor and Environment		
WordStar® compatible	Yes	Yes
Context-sensitive help for C language	Yes	—
Context-sensitive help for C functions	Yes	—
Brace, bracket & parenthesis matching	Yes	—
Mouse support	Yes	—
Support for EGA 43-line mode	Yes	—
Documentation		
Complete C language reference	Yes	—
Examples for every library routine	Yes	—
Compiler		
Completely Microsoft CodeView compatible	Yes	—
Automatic enregistering	Yes	Yes
Integrated MAKE		
Automatically generates .MAK file	Yes	—
In-memory MAKE compatible with stand-alone MAKE	Yes	—
Include file dependencies	Yes	Yes
Libraries		
Graphics library included	Yes	—
CGA & EGA and VGA support	Yes	—
Library source code available	Yes ($150)	Yes ($150)
Microsoft C Optimizing Compiler 5.0 compatible	Yes	—
Microsoft LINK vs. Turbo Link		
Links programs up to 640K	Yes	—
Supports overlays	Yes	—
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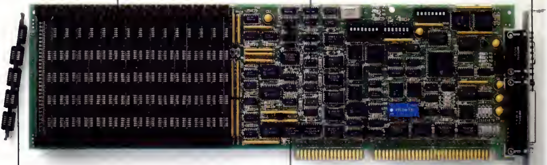

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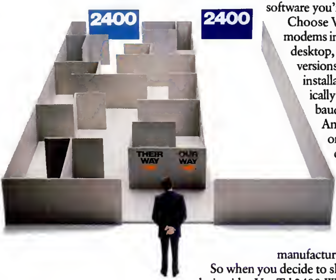

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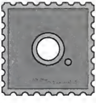
CIRCLE 364 ON READER SERVICE CARD

LETTERS TO PC MAGAZINE



THE ORIGIN OF WINCHESTER

In reference to the sidebar "Hard, Fixed, Rigid, Winchester—What's in a Name?" ("Hard Disk Heavyweights," *PC Magazine*, Volume 6 Number 11), I believe I have the answer.

The term "Winchester" was first brought to the attention of the public during a court case involving a stolen disk drive that IBM was developing. The drive, originally known as a direct-access storage device, was based on two 30-megabyte hard disk modules. Since the device was a prototype, it had no official name; however, Ken Haughton, inspired by the fact that he owned a Winchester 30-30 rifle, code-named the device "Winchester." This term came up repeatedly during court testimony, and reporters covering the trial consistently used it to describe the device.

HARD DISK HEAVYWEIGHTS

Michael Tighe
Freehold, New Jersey

I stand corrected. Although I regarded the Wild West implications of the Winchester name as apocryphal, I checked with IBM's Hursely Research Laboratory, which is near Winchester, England. According to the lab, the internal IBM designation of the first device now termed "Winchester" was, in fact, 3030, and it thus earned its nickname from the relation between that designation and the model number of the famous repeating rifle. The fact that Winchester research went on at the lab near Winchester appears to be either coincidental or synchronistic.—Winn L. Rosch

HARD DISKS HANDLED WELL

I just finished reading your wonderful, looooong article on hard disk management ("How to Handle Your Hard Disk," *PC Magazine*, Volume 6 Number 11). It's certainly the most useful article that I can remember reading, outside of your annual printer reviews.

J. Haenlin
Aurora, New York

The fact that I would like to shake your hand and thank you may not mean much to you, but I would—you have ended my hard disk nightmares ("How to Handle Your Hard Disk").

I am a 62-year-old woman and it is not always easy to get the younger computer generation to help me with my hard disk problems. I also find that classes, manuals, and articles all focus on the negatives without positive input. It still feels painful to sit at the keyboard, but there is hope now that I can get my disk organized and understand what I am doing. Thank you, thank you for an outstanding article.

Constance Crasey
Dundee, Michigan

Just a brief note of thanks for the article on hard disks ("How to Handle Your Hard Disk"). It was perhaps one of the most complete, lucid articles to appear in the magazine on any subject. Not only was it a big help, but it was worth the year's subscription price alone.

Dick Mesirov
Gladwyne, Pennsylvania

As a member of the computer education faculty at The National Judicial College at the University of Nevada at Reno, I am constantly on the lookout for articles that would be of value to judicial students enrolled in our computer courses. Such an article appeared in your June 9, 1987, issue: "How to Handle Your Hard Disk." *PC Magazine* has met with a very favorable response from even our neophyte judges who have never used computers before.

Judge David L. Phares
Reno, Nevada

MORE WORD ORIGINS

I really enjoyed John C. Dvorak's explanation of the origins of the word "nerd" (John C. Dvorak, *PC Magazine*, Volume 6 Number 10). As a fan of Dr. Seuss books, I found it quite enlightening. And as a graduate of Rensselaer Polytechnic Institute, I must tell you that the word "knurd" is and always will be defined as you stated: the inverse of "drunk." I'm sorry I can't help you out with "twerp."

Gloria S. Friedman
Elmira, New York

Thanks for tracking down the origin of the word "nerd" (John C. Dvorak). His "knurd" false lead reminds me of "wonk" ("know" spelled backward), which was popular at Harvard when I was there in the late '60s. "Wonk" did mean a student who studied all the time and got straight A's.

Sam Baker
Columbia, South Carolina

SHOULD HAVE WAITED

In his column "Motherboards and Apple Pie" (*PC Magazine*, Volume 6 Number 11), Stewart Alsop says, "I did wonder what people who had bought a [Compaq] Portable II thought of the III." Well, let me tell you how I feel having waited through a 3-month backlog only to have

■ LETTERS

Compaq announce a more compact, higher-speed machine with a faster disk drive and far more expandable memory 6 months later. As Mr. Alsop says, "I feel as though Compaq has just thumbed its nose at me and said, 'You fool, you should have waited.' " I also wish Compaq would soften its blow by providing upgrade options to existing customers.

Mel B. Burstein
Cypress, California

Come off it, Stewart Alsop! Millions of Americans happily trade in their cars every year or two for new ones with only incremental changes from the old models (Stewart Alsop, *PC Magazine*, Volume 6 Number 11). They don't expect the manufacturer to make it possible to upgrade their '87 models to an '88. So if you really want an '87 Compaq 286 with more horsepower and a moonroof, trade it in as you would your car.

I. Switzer
Palm Springs, California

DOES BOOT

We must take exception to Winn L. Rosch's statement that the host adapter will not let the Kodak Verbatim 12 disk drive serve as the boot device ("Half-Height Alternatives: Cartridge Systems from Iomega and Kodak," *PC Magazine*, Volume 6 Number 11).

Our ASC-88 host adapter for the Kodak cartridge system will allow both booting and device driver operation. In addition, ASC provides a disk change utility program that facilitates cartridge changes from the boot device.

William J. Casey
President, ASC
Houston, Texas

At the time my story was written, Kodak did not support such a feature.
—Winn L. Rosch

DIREC-LINK CLARIFIED

In the article "The Technology of Transfer" (*PC Magazine*, Volume 6 Number 13), Howard Marks incorrectly implied that *Direc-Link* scans the hard disk each time the program is run. Actually, the disk is scanned the first time you run the program, and a short file is created that contains a picture of the disk's directories. After that first time, the program finds that file and displays the tree picture.

Also, Mr. Marks stated that the program is "a device-driver-like product." *Direc-Link* is a straightforward .COM program that's compatible with multiple versions of DOS, with memory-resident programs, and with device-driver systems such as Bernoulli disks.

Finally, he indicated that copying files is "backward," in that you first select the destination directory and then tag the files that you wish to send. This sequence is at the user's discretion.

Robert L. Kurtz
President, Micro-Z Company
Rolling Hills Estates, California

I agree that using the directory tree that is stored in memory saves an enormous amount of time when there have been no file changes. But if you have changed the directory structure since the last time you used it, then you have to scan again, saving no time. It's a fact that very few people leave their directories unchanged for very long.

PC Magazine *does regret two errors:* Direc-Link *is not a device-driver-like product, and the copy parameter order is user-selectable.*—Howard Marks

A VALID COMPLAINT

How is Mr. Langsner (Letters to PC Magazine, *PC Magazine*, Volume 6 Number 12) supposed to know he's ordering a "free lunch" when he thinks he's just ordering the equivalent of cheap fast food? His complaint is a valid one: the MicroCom advertisement is deceptive. There is no indication in the ad that these are shareware products, there is no clue that the products are owned by anyone other than the advertiser, and there is no way to tell that the company advertising is a distributor. Most deceptive of all, there is no indication that there may be additional registration fees.

Trudy Schmidt
San Francisco, California

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■ LETTERS

Mr. Langsner complains that he was unaware of MicroCom Systems' distribution practices, and, having ordered A86 *and* D86, *was convinced that he now owed $70 to the shareware author. This is not true. No shareware product distributed by MicroCom Systems has ever required payment of fees simply on the basis that a user has a copy of the product—such a policy would defeat the whole purpose of shareware. Users of* A86 *and* D86 *need not register unless they decide to use these products after evaluating them.*

> ■ Thanks to Michael J. Mefford's IBMFIX, the CapsLock key is now the Ctrl key and vice versa, just like they should be. What a charm.

Although MicroCom Systems cannot describe each shareware product's usage terms in its display ads, our newer ads include a standard phrase that attempts to better describe the nature of the software to potential customers.—J. Kelly Johnson, President, MicroCom Systems

ADDRESS LISTED

In the article "The Best of the Best Utilities" (*PC Magazine*, Volume 6 Number 12), you highly recommend *LIST*, a program by Vernon Buerg, but you do not give a mailing address. Please give me his address so that I may follow up on your recommendation.

THE BEST of the BEST UTILITIES

Harvey Tannenbaum
Reisterstown, Maryland

Since we published the review, Mr. Buerg has released LIST, *Version 6.2A, which adds or corrects several dozen features. At $15, it's now even more of a bargain. The mailing address is Vernon D. Buerg, 456 Lakeshire Dr., Daly City, CA 94015.*

KEYBOARD RELIEF

I'd like to give a big thanks to Michael J. Mefford for his IBMFIX program (User-to-User, *PC Magazine*, Volume 6 Number 11). For several weeks, I had been struggling with the keyboard on a new XT when using *PC-Write* and *WordStar*—I was tired of having my hand twisted like a victim of chronic arthritis. Thanks to IBMFIX, the CapsLock key is now the Ctrl key and vice versa, just like they should be. What a charm.

R. Lamar Smith
Atlanta, Georgia

CORRECTIONS/AMPLIFICATIONS

Hot Print, from Ron Turley Computer Associates, uses Shift-Alt key combinations, not Ctrl-Alt, as was mentioned in "NetWare Utilities Fill the Duty Roster" (*PC Magazine*, Volume 6 Number 7).

Cove Software Group's *PCED* utility ("The Best of the Best Utilities," *PC Magazine*, Volume 6 Number 12) does not create macros and does not compete with or replace keyboard enhancers.

The correct price of Revolution Software's *Cruise Control* is $39.95 ("The Best of the Best Utilities," page 286).

The correct phone number for information on Turner Hall Publishing's *SQZ!* is (408) 253-9600 ("The Best of the Best Utilities").

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Do you have a comment, compliment, or criticism about something you've read in *PC Magazine*? A question you'd like to open up to other readers? Then send your opinion to Letters to PC Magazine, One Park Avenue, New York, NY 10016, or through MCI Mail to PCMAGAZINE.

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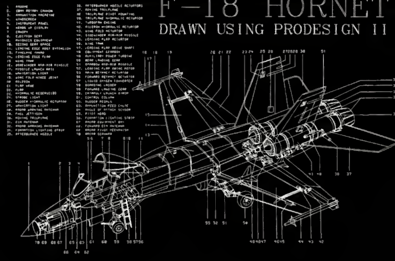

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SUPER SOURCE

Source Print

Author Alan Simpson writes "the best overall debugging technique is to draw lines to connect all the IF and DO WHILEs etc with their ENDIFs and ENDDOs Then use a pencil to —Well, thanks, Alan but we'll use Source Print instead It draws those vertical lines to connect the beginnings and endings of structure in a vivid display of your program's organization It can print your programs with page numbers headings, line numbers, indent automatically, throw in a table of contents and cross-reference index "Occasionally a utility comes along that makes a programmer's life much easier Source Print is such a program" says *PC Magazine* List **$75, Ours: $60.**

...add Tree Diagrammer

Tree Diagrammer prints an organization chart of your program's structure showing the hierarchy of function, procedure and subroutine calls Shows at a glance what routines call each other for clearer debugging Every shop should have this important documentation tool List **$55** Ours **$45.**

C-TREE & R-TREE

B-Tree File Manager Now Has Report Generator

c-tree: The only major b tree file manager with network support in the standard low cost version c-tree™ gives you record-locking routines for DOS 3 1/3 2, UNIX and XENIX and it even comes in C source code, yet there are no royalties Source sticks to K&R, so C-tree is portable Tests in many environments prove it

Permits any number of keys for a data file alpha numeric even floating point Handles files with varied record lengths multiple keys in one index file Both high level and decomposed functions It s the works

r-tree: Adds the ability to produce ad hoc reports from files maintained by c-tree (v 4 1 and up) Link a file description to the r-tree™ library and use any text editor to write report scripts with no further C coding Reports can access data in several files select on criteria join findings into new logical records sort them, calculate new fields and columns, tabulate by control breaks Comes in source same portability as c-tree and fits any compiler

	List	Ours	Combined
c-tree	**$395**	**$329**	**$541**
r-tree	**$295**	**$245**	

WINDOWS for DATA

FIRST PRIZE!

M'Soft Windows Compatible

Only one package can be easily recommended " said *Computer Language* (June '87) reviewing nine window and data entry products for C Complete field level functions specify prompt string field length data type, screen location picture target variable, entry rules help messages even functions to call for validation once data keyed in

Windows for C is a subset No data entry but all windowing functions Unlimited windows can be made either to pop up or permanently overwrite the screen, scroll and highlight lists vertically and horizontally Specify Compiler Windows for Data List **$395,** Ours **$349.** Windows for C List **$245,** Here **$216.**

ESSENTIAL C UTILITY LIBRARY

400 Functions, 30c Each

You ve probably seen the speed and power of Essential s C function library without knowing it Software greats have been using it for some time to give today's top products pizazz and panache

Now grown to 400 functions Essential produces pop-up menus saves and restores screens and windows to disk or memory in as little as 1/10th second and claims the fastest video output available Library has 50 business graphics functions, 40 string handlers, 28 functions for printers, 18 for mice, 11 for time and date, DOS interface functions for disk error trapping directory and file creation and management lots more Everything in source, including sample programs We have versions with pre-built libraries for the well-known C compilers and a source code librarian is supplied for rolling your own

	List	PC Brand
C Utility Library	**$185**	**$119**
Essential Graphics	**$250**	**$183**
Essential Communications	**$185**	**$125**
with Breakout Debugger	**$250**	**$189**

Shopping List for the Power Workbench

	LIST	US
ARITY PRODUCTS		
Arity Combination Package	1095	979
Expert System Development Pkg	295	229
File Interchange Toolkit	50	44
PROLOG Compiler & Interpreter	650	569
Screen Design Toolkit	50	44
SQL Development Package	295	229
Arity PROLOG Interpreter	295	229
Arity Standard Prolog	95	77
AI-EXPERT SYSTEMS		
AutoIntelligence *by IntelligenceWare*	990	739
Experteach II *by IntelligenceWare*	475	339
EXSYS *Development Software by EXSYS*	395	309
EXSYS Runtime System	600	469
Insight 2+ *by Level Five Research*	485	379
Intelligence/Compiler *IntelligenceWare*	990	739
AI-LISP LANGUAGES		
IQCLISP *by Integral Quality*	300	Call
IQLISP *by Integral Quality*	270	Call
Microsoft LISP *Common LISP*	250	199
TransLISP *from Solution Systems*	95	Call
TransLISP PLUS *from Solution Systems*	195	Call
AI-PROLOG LANGUAGES		
APT *Active Prolog Tutor from Solution Sys*	65	Call
MPROLOG Language Primer *LOGICWARE*	50	45
MPROLOG P500 *by LOGICWARE*	495	395
MPROLOG P550 *by LOGICWARE*	220	175
Prolog-86 *from Solution Systems*	125	Call
Prolog-86 Plus *from Solution Systems*	250	Call
Turbo PROLOG *by Borland Int'l*	100	83
Turbo PROLOG Toolbox *by Borland Int'l*	100	64
ASSEMBLERS & DEBUGGERS		
Advanced Trace-86 *Morgan Debugger*	175	118
C-Sprite Debugger *by Lattice, source level*	175	139
Microsoft Macro Assembler *with Utilities*	150	109
PASM86 *by Phoenix, Macro Assembler*	195	138
Periscope I Debugger *The Periscope Co*	345	289
Periscope II *with NMI Breakout Switch*	175	139
Periscope II-X *software only*	145	105
Periscope III *with Advanced Board New*	995	Call
BASIC LANGUAGES		
Microsoft BASIC Interpreter *for XENIX*	350	295
Microsoft QuickBASIC Compiler *3 0*	99	79
BORLAND PRODUCTS		
Reflex & Reflex Workshop	200	129
Reflex *Data Base System*	150	98
Reflex Workshop	70	45
Turbo Basic *New*	100	64
Turbo C Compiler *New*	100	64
Turbo Lightning	100	64
Turbo Pascal & Tutor *New*	125	85
Turbo Pascal with 8087 & BCD	100	64
Turbo PROLOG Compiler	100	63
Turbo PROLOG Toolbox	100	64
Turbo Tutor	40	28
C COMPILERS		
C86 PLUS *by Computer Innovations New*	497	397
Lattice C Compiler *from Lattice*	500	299
Let's C Compiler *by Mark Williams*	75	55
with CSD Source Level Debugger	125	90
MWC-86: Mark Williams C Development	495	369
Microsoft C Compiler *4 0*	450	295
Turbo C Compiler *by Borland New*	100	64
C INTERPRETERS		
C-Terp *by Gimpel Software*	300	249
Instant C *by Rational Systems*	500	395
Interactive-C *by IMPACC with debugging*	249	218
RUN/C Professional *from Lifeboat*	250	185
COMMUNICATIONS		
Asynch Manager *by Blaise, for C or Pascal*	175	117

	LIST	US
Greenleaf Communications *by Greenleaf*	185	136
C UTILITY LIBRARIES		
Blaise C Tools Plus	175	135
Blaise C Tools	125	84
Blaise C Tools 2	100	84
C Food Smorgasbord *by Lattice*	150	109
C Utility Library *by Essential, 300 functions*	185	119
Greenleaf Functions *by Greenleaf Software*	185	139
COBOL LANGUAGES		
RM/COBOL *see Ryan McFarland Prod*		
Microsoft COBOL Compiler	700	499
Microsoft COBOL Compiler *for XENIX*	995	795
Micro Focus COBOL *see Micro Focus Prod*		
dBASE SUPPORT		
BRIEF/dBRIEF *Brief for dBASE III*	275	Call
CLIPPER *from Nantucket*	695	375
McMAX *dBASE for MAC from Nantucket*	295	Call
dBx *dBASE to C Translator by DESKTOP AI*	350	299
with Library Source Code	550	469
with Full Source Code	1500	1282
dBC *from Lattice maintains DBASE files*	250	195
with source	500	390
dBC III Plus *supports multi-user DBASE*	750	595
with source	1500	1195
DEVELOPMENT TOOLS		
BASTOC *by JMI, convert BASIC to C*	495	399
BASIC-C *BASIC's functions added to C*	175	139
Report Option *Softcraft Btrieve Report Gen*	145	128
Xtrieve *Softcraft Query Utility for Btrieve*	245	220
Code Sifter *Profiler by David Smith*	119	88
Dan Bricklin's Demo Program *Prototyper*	75	69
LMK *from Lattice, "make" like UNIX*	195	149
Microsoft Window Development Toolkit	500	365
ESSENTIAL PRODUCTS		
C Utility Library	185	118
Essential Graphics	250	183
Essential Comm Library	185	125
with Breakout Debugger	250	199
FILE MANAGERS		
Btrieve *by Softcraft, no royalties*	250	185
Btrieve Network *by Softcraft*	595	465
C-Tree *by FairCom no royalties, source*	395	329
R-Tree *by FairCom Report Generator*	295	245
C-Tree & R-Tree Combo *by FairCom*	650	541
dbVista *single user DBMS by Raima*	195	139
dbVista *multi user DBMS*	495	399
Opt-Tech Sort *Can sort Btrieve files*	149	105
FORTRAN LANGUAGES		
RM/FORTRAN *by Ryan McFarland*	595	499
FORTRAN Libraries *by Alpha Computer*	70	45
Microsoft FORTRAN *Links w/Microsoft C*	450	291
Microsoft FORTRAN *for XENIX*	695	546
Scientific Subroutine Package *by Alpha*	295	239
GRAPHICS		
Essential Graphics *Essential, no royalties*	250	183
GSS Graphics Development Toolkit	495	375
GSS Kernel System *by Graphic Software*	495	375
GSS Metafile Interpreter	295	235
Halo *by Media Cybernetics*	300	218
with **Dr. Halo II**	440	299
Halo for Microsoft *includes all fonts*	595	434
MICRO FOCUS PRODUCTS		
Micro Focus Level II COBOL *w/Animator*	495	395
Level II COBOL	349	278
Level II Animator	195	155
Micro Focus Personal COBOL	149	99
Forms-2	295	235
MODULA-2 LANGUAGES		
MODULA-2 Apprentice Pkg *by LOGITECH*	99	79

	LIST	US
MODULA-2 Magic Pkg *by LOGITECH*	99	79
MODULA-2 ROM Pkg & Cross RT Debugger	299	239
MODULA-2 Window Pkg *by LOGITECH*	49	39
MODULA-2 Wizard's Pkg *by LOGITECH*	199	159
OTHER LANGUAGES & UTILITIES		
Source Print *source code formatter*	75	60
Tree Diagrammer *source code diagrammer*	55	45
HelpiControl *by MOS 123 style Help*	125	109
Microsoft MuMath *includes MuSimp*	300	199
Microsoft Pascal Compiler *Links w/M'soft C*	300	199
Microsoft Pascal Compiler *for XENIX*	695	546
Turbo Power Tools+ *by Blaise*	100	67
Advantage C++ *by Lifeboat Assoc*	495	435
PHOENIX PRODUCTS		
PASM86 *Macro Assembler*	195	138
PDisk *Phoenix's new disk manager*	195	138
Pfantasy Pac *six products New Price*	995	855
PFinish *EXE performance analyzer*	395	279
Pfix86 Plus *Symbolic Debugger*	395	259
PforCe *vast library*	395	259
PforCe++ *Function Library for C++*	395	278
Plink86 Plus *Utilizes memory for overlays*	495	326
Pmaker *like UNIX "make"*	125	89
Pmate *with Macros*	195	138
Pre-C *UNIX "lint"-alike*	295	195
PTel *Binary File Communicator*	195	138
POLYTRON PRODUCTS		
PVCS Corporate *Source Code Control Syst*	395	309
PVCS Personal	149	109
PVCS Network	Call	Call
PolyMake *Complete Make Utility*	149	109
PolyLibrarian *Library Manager*	99	73
PolyLibrarian II *Library Manaer*	149	109
PolyShell *UNIX-like Command Shell*	149	109
PolyXREF *Complete Cross Ref Utility*	219	199
PolyXREF *One language only*	129	99
PolyBoost *The Software Accelerator*	80	64
PolyDesk III *3rd Generation Desktop Org*	99	73
PolyDesk III *Add On Tools*	Call	Call
RYAN-McFARLAND PRODUCTS		
RM/FORTRAN *2 4 New*	595	409
RM/FORTRAN *UNIX or XENIX*	750	599
RM/COBOL *DOS*	950	799
RM/COBOL *UNIX or XENIX*	1250	999
RM/COBOL Run Time	250	199
RM/COBOL 85 *ANSI 85 COBOL*	1250	995
RM/COBOL 85 RUN TIME	300	249
RM/SCREEN *for COBOL 85*	395	335
RM/NET +5 *COBOL & COBOL 85 Network*	300	249
SCREEN DESIGN		
Curses *by Lattice, UNIX screen designer*	125	99
with Source	250	199
Greenleaf Data Windows *New*	225	159
with source	395	297
Panel Plus *by Round Hill, no royalties New*	495	395
View Manager for C *by Blaise*	275	199
Vitamin C *by Creative Programming*	225	199
VC Screen *by Creative Programming*	100	81
Windows for C *Vermont Creative Software*	245	219
Windows for Data *includes Windows for C*	395	349
ZView *Data Management Consultants*	245	175
TEXT EDITORS		
Brief *from Solution Systems*	195	Call
Condor Editor *by Condor*	130	118
Edix *by Emerging Tech Multi-screen*	195	159
Epsilon *by Lugaru Software, like EMACS*	195	149
FireTime *by Spruce Technology, C syntax*	295	229
Kedit *by Mansfield, similar to Xedit*	125	99
LSE, the Lattice Screen Editor *Multi Wind*	125	100
Vedit *by Compuview*	150	99
Vedit Plus *by Compuview*	185	129

10 BIG REASONS IT'S TIME YOU CHANGED YOUR EDITOR TO BRIEF

1 FUNDAMENTAL TRUTH. If you are a programmer, you use your editor more than any other tool. If it isn't the best, the fastest, the most versatile, the most productive...well, then neither are you!

2 OUR ENTHUSIASM. While we do not publish BRIEF we wish we did. We sell so many BRIEFs that we've been advertising it non-stop since it was introduced two years ago. We're not alone in our enthusiasm. There is no end of accolades from other admirers.

BRIEF Encounters

"The word is getting around that BRIEF is simply the best text editor you can buy." John Dvorak in *Infoworld*

"In the last five years only a handful of applications have altered the way we use microcomputers. The 'winners' impact is astounding. BRIEF is a 'winner' that will most definitely change the way we develop application software." *Data Based Advisor*

"Overall, BRIEF is an excellent and efficient editor with capabilities that are truly useful. If you're a serious programmer or developer of commercial applications, the BRIEF/dBRIEF package is one of the best investments you can make." *PC Magazine*, 7/86

"Every time I've mentioned text editors I've got a raft of mail urging me to try Brief. Now that I've tried it I see why. It has windows—boy, does it ever have windows! it will do just about anything you want it to... look no further... recommended." Jerry Pournelle, *Byte* 12/86

Best editor of 10 compared
Dr. Dobb's Software Tools

3 WINDOWS ON THE WORLD. Why the excitement? First, BRIEF's architecture. *Any number of files* of virtually any length can be open. (Start BRIEF with "* *" to prove it.) Open as many tiled windows as fit the screen—over/under and side-by-side—to work on any of your files. Open, close, and resize windows as you go. In each window, full screen or tiny, all editing techniques are at hand—high-speed cursoring, paging up and down, horizontal scrolling, optional word wrap. Load the same file in any number of windows to view different areas simultaneously. A change in one changes all. Cut and paste text blocks between windows and files, or into buffers for later recall. All files stay in memory, so you can always go back to snip some more.

4 WHOLLY MACROS. Much of BRIEF was written in its own macro language. It is that powerful! The language and its compiler come with every copy, as do many standard macros, with source code for learning by example. It is a complete language with conditionals, loops, recursion, global and local variables, even data types. It can control files, windows, and the keyboard. It has structure, 32-character variable names, and—not at all like 1-2-3's cuneiform—is entirely readable, like a hybrid of LISP and C. With it you can develop a library of routines to power BRIEF your way.

5 UNDO. NOT UN-DELETE. Don't confuse the two. BRIEF doesn't just keep snapshots of recent deletions should you want to pick them up from the cutting room floor. It can reel the whole film backward undoing any command that affected the cursor or the text. Watch it undo a global replace, for example. Uncanny. It can back up 300 times, all the way to the beginning of a session. "Works like a dream", said *The C Journal*.

6 SHELL GAMES. Leave BRIEF, run your compiler, print out the error messages, load up BRIEF again? No way! Run your compiler from *inside* BRIEF.* It will point to each error line in your source program, still loaded in memory, for immediate editing. You don't have to leave BRIEF to use DOS either. BRIEF disappears from the screen to get out of your way, but say bye to DOS and BRIEF pops back to the screen, as do all the files you were working on.

7 KEY WHIZ. You can reassign BRIEF's command keyhits to whatever keys you're used to, even your old editor's, so you don't have to send your fingers back to school. Macro execution can be assigned to single keys. Or you can tell BRIEF to listen while you tap out a complex routine. It will save and playback faithfully, a shortcut macro without a single line of coding.

8 MULTI-LINGUAL. BRIEF's macro language is perfect for writing formatters for your language which indent, match up parentheses and brackets, and set up statement templates for fill-in. BRIEF comes with C language support already built in. Others have written macros to format Pascal, BASIC, LISP, Prolog, FORTRAN.

9 QUICKER PICKER-UPPER. Looking for something? BRIEF has full UNIX®-like expression search tools to forage and find and fix any file in memory. Literal strings with wildcards and "?" character masking, sure. But also indifference to case or intervening characters, [aeiou] to match all vowels, or [~aeiou] to match anything *but* vowels, [a-f,l-m] to match character ranges, beginning or end of line searches, even multiple choice pattern matching and replacement.

10 REASONS 11 THROUGH 20: **11.** BRIEF comes with a color option. You can select your own color scheme anytime. **12.** It supports EGA's 43-line mode and can display up to 128 lines long. **13.** Full 8-bit ASCII display, the whole character set can show on screen. **14.** Full path support. **15.** Command line start-up flags to modify BRIEF's behavior, change a path name, or run a macro, for example "wp" which turns BRIEF into a word processor with wraparound and margin setting. **16.** Automatic file save during idle moments. **17.** Compatibility with most stay-resident programs (like Sidekick™), multitaskers (like Microsoft Windows™), and networks. **18.** A bulletin board with public domain macros contributed by a mushrooming cult of macromancers. **19.** No copy protection. **20.** Context sensitive help, and phone support from the publisher.

dBRIEF. The Power Environment for dBASE Programming

Many worthy utility products supply needs that dBASE®'s programming language doesn't—dUTIL™, dFLOW™ and a host of others. Trouble is, you have to use them separately, then combine their output into your dBASE program files.

No longer. dBRIEF™, written in BRIEF's macro language, grabs hold of BRIEF and turns it into a complete dBASE III and III Plus programming domain. Using BRIEF's underlying shell capabilities and its own interfaces, dBRIEF can run external utility libraries, plus dBASE itself, and link to the Clipper™, Foxbase+™ and Quicksilver compilers, all with dBRIEF still loaded and running the show. It can do what BRIEF already does plus:

- Convert a screen layout into dBASE code for interactive data entry
- Display dBASE file structures in windows, a great convenience alongside your program files
- Expand keystrokes into full dBASE statements
- Indent automatically for clegic display
- Create databases, index files, invoke Ashton-Tate's dFORMAT™ and dCONVERT™, draw lines and boxes

"Simply marvelous programming environment for writing and editing dBASE programs..." *PC Magazine*, 7/86. Source code included!

Requires BRIEF 1.32 or later and 384k. 512k to run dBASE within dBRIEF. 640k and harddisk recommended.

* Brief needs 192k normally, 320k for compile feature. •Product must be returned in resalable condition.

NEW VERSION 2.0!

Support for more languages • Regular expressions match over multiple lines • Faster undo & expression search • Added types of block marking • Optional borderless windows • Supports displays with 127 lines, 255 chars • New documentation with tutorials on regular expressions and macros ***30 DAY TRIAL*** *with no-questions-asked money-back guarantee!*

800 PC-BRAND

List Prices: BRIEF: $195. dBRIEF: $95
BRIEF/dBRIEF Combination: $275.
PC BRAND Prices: CALL

CIRCLE 310 ON READER SERVICE CARD

dBASE USERS!

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NOW 100% CLIPPER 100% FOXBASE+ COMPATIBLE

Let's face it. Coding is a waste of time. Why should you have to work hard just to get dBASE to do what you want?

You shouldn't. And now you don't.

Let QUICKCODE PLUS do it *for* you. QUICKCODE PLUS is a *complete* application generator which automatically writes your dBASE programs. Design any kind of screen using the built-in Form Editor. Then, use lightning-fast 1-2-3™ style commands to tell QUICKCODE PLUS all about your application (files, fields, computations, menus, etc.)

After that, just sit back and watch as QUICKCODE PLUS produces some of the best dBASE programs you've ever seen. Modular, standardized, highly commented code which you can easily modify.

And we're not talking about limited "skeleton" programs which you could easily write yourself. These programs are comparable to those written by a dBASE expert.

Can you imagine how much easier your work would be if you had QUICKCODE PLUS? Order it now and STOP wasting time!

Features

Forms: Maximum size = 11 pages, maximum number of fields = 512

Data Types: Character, Money, Date, Integer, Numeric, Telephone, Soc Sec, Logical, Memo

Field Types: Protected or Non-Protected, DBF or Memory, Display or Non-Display, User Defined

Validation Types: Range, List, File, and any expression allowed in dBASE

Computations: Anything allowed in dBASE, performed on screen as you enter or change data, full support for Clipper functions

Supplied Programs: General purpose LOOKUP and UPDATE programs included as dBASE source code. Use them in any application.

Linked Files: Link up to 5 databases together on one form using relations.

Menu Generator: dBASE programs or high-speed QUICK MENUS.

Advanced Form Editor: Specifically designed for building database forms

Printer: Use **BOLD**, *ITALICS*, etc.

Customization: Many features

Requires dBASE III PLUS and 384K RAM

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Not getting enough mileage out of your dBASE reports? Is REPORT FORM too *weak* and programming it yourself too *slow*?

Than it's time to switch to something a lot stronger...QUICKREPORT.

QUICKREPORT is the dBASE report writer you've always wanted. The one which lets you design reports in seconds simply by drawing them on the screen—without any programming.

No longer are you limited to one line per record. Put text and data anywhere you like (including computed fields, totals, averages, etc.)

No longer are you limited to one database per report. With QUICKREPORT, you can link together up to 6 databases and use such powerful features as file chaining and transaction processing.

You can also sort, group, and total data on up to 16 fields, with unique headers/footers for each page and each break group. Use printer features like **BOLD** and *ITALICS*.

QUICKREPORT gives you plenty of power. But its user interface is so friendly that PC Magazine called it "elegant." So while you're using all that power, *you* can take it easy.

And isn't that what computers are for?

NEW! Free, Unlimited Use Runtime License

What the Critics Say:

"Quickreport is elegant." PC Magazine

"Quickreport from Fox & Geller is a top-notch report generator that's easy to learn and operate . . . a furlong ahead of dBASE." PC World

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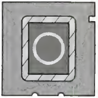
CIRCLE 246 ON READER SERVICE CARD

■ **MITT JONES**



PC ADVISOR

Help in breaking through BASIC's 64K limit, in printing your spreadsheet graphs sideways, and in starting your own on-line bulletin board.

BUSTING BASIC'S LIMIT

I was disappointed to find that GW-BASIC has a program size limit of 64K bytes. Is there any way to get around this limit?

Robert W. Freedman
Mars, Pennsylvania

The best way around this predicament is buying one of the latest wave of BASIC compilers. In addition to offering many other features you won't find in GW-BASIC or BASICA, both QuickBASIC 3.0 ($99; Microsoft Corp., Redmond, Wash., (206) 882-8080) and Turbo Basic ($99; Borland International Inc., Scotts Valley, Calif., (408) 438-8400) offer solutions to the 64K limit.

The best way to work with programs that exceed 64K of compiled code in QuickBASIC is to organize your program in subprograms, compile those subprograms into modules of no more than 64K of compiled code, and then build a user library from those modules. Then you can reference that library from a main program, which must have a compiled size of 64K or less. This method lets you debug the entire program as one unit if you've included debugging information in your user library.

Turbo Basic makes life somewhat easier, requiring only a compiler directive, $SEGMENT, within your code to mark the beginning of a new segment. Each segment must be 64K or smaller, and you can mark as many as 16 segments in each program, though of course your system's memory will prohibit each of the 16 segments from being 64K.

PRINTING GRAPHS SIDEWAYS

I'm having a hard time squeezing all my data onto my spreadsheet package's graphs. I'm searching for a program that will turn graphs sideways to give me more room. I have *Sideways* and would love to use it for my spreadsheets, but it works only with text.

David Standridge
Taipei, Taiwan

Pizazz *($49.95; Application Techniques Inc., Pepperell, Mass., (617) 433-5201) will rotate any image you display on your screen to print in landscape orientation (sideways). This package can also touch up your graphics in other ways, by altering colors and smoothing jagged edges, for example.* Pizazz *is memory resident and uses the PrtSc key as the "hot key."*

However, it sounds as if you've outgrown your spreadsheet's graphics abilities. Rather than loading up with utilities that may solve only some of your problems, consider investing in a presentation graphics package.

Unless your spreadsheet uses an oddball file format, a graphics package worth its salt will be able to directly read your files or convert them to its own format. This means you won't have to recreate your data.

Harvard Graphics *($395; Software Publishing Corp., Mountain View, Calif., (415) 962-8910) offers a fair amount of flexibility and excels in ease of use.*

While more difficult to use, Freelance Plus *($495; Lotus Development Corp., Cambridge, Mass., (800) 248-8002) gives you control over every aspect of your graphs and includes freehand-drawing capabilities.*

Both of these packages can rotate graphs to print in landscape orientation, but you'll appreciate them for many other reasons as well.

■ Rather than loading up with utilities that may solve only some of your problems, consider investing in a presentation graphics package.

STARTING A BULLETIN BOARD

I'm planning to set up a bulletin board for legal professionals, but I'm not sure where to start. What software would you recommend for this purpose, and what would be the best way to secure it from intruders?

Larry Caruso
College Station, Texas

Which specific bulletin board software will be best for you depends largely on what sort of services you plan to offer and how many phone lines you plan to support.

If you want to offer a wide range of services on your system but want to keep price

■ PC ADVISOR

to a minimum, consider Fido *or* RBBS (Remote Bulletin Board System)*—two popular and inexpensive BBS packages.*

Fido *($100; Fido Software, San Francisco, Calif., (415) 764-1688) offers multiple message areas and eight file transfer protocols. Though essentially a one-line system, you can set up multiple board systems on separate PCs and easily send electronic mail back and forth. Past versions of* Fido *have been rather complex to set up, but a new version purports to make setup much easier.*

RBBS *(Capitol PC Users Group Inc., Gaithersburg, Md.) rates as probably the most popular personal-computer bulletin board system. Aside from costing only $8,* RBBS *is simple, though somewhat tedious, to set up and offers a nice range of features, including multiline support, conferencing, system bulletins, and a powerful range of message services. However,* RBBS *is public domain software, so you'll have to depend on getting help from* RBBS *users scattered across the country if you run into problems. Your local user group may be of some help.*

If you're willing to pay a bit more to get up and running, consider Chairman *(Dynamic Microprocessor Associates (DMA), New York, N.Y., (212) 687-7115). For flexibility, speed, ease of setup, security, and company support, you can't go wrong. Our PC Magazine Interactive Reader Service (PC-IRS) runs on a modified version of* Chairman.

> ■ Aside from costing only $8, *RBBS* is simple to set up and offers a nice range of features.

DMA markets two versions of Chairman*—a single-line version for $295 and a six-line version for $995. Both versions offer a plethora of features, including six levels of password protection, privileges keyed to individuals, and full-featured electronic mail. You can customize the system in a variety of ways.*

Though setting up a small bulletin board is easier than it sounds, you'd be wise to study the topic a bit before you dive in headfirst. Pick up a copy of Patrick R. Dewey's Essential Guide to Bulletin Board Systems *(ISBN 0-88736-066-1; Meckler Publishing Corp., Westport, Conn.).*

ASK THE ADVISOR

Send your questions to the PC Advisor, *PC Magazine*, One Park Avenue, New York, NY 10016. Please specify what equipment you have.

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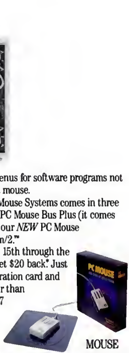

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CIRCLE 526 ON READER SERVICE CARD

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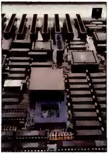

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CIRCLE 276 ON READER SERVICE CARD

PC MAGAZINE FIRST LOOKS

V-series Raises the Hayes Standard Up to 9,600 bps

PC HANDS ON

BY HOWARD MARKS

It seems that every 2 years or so the definition of a high-speed modem needs to be revised. Now that 2,400-bps modems are becoming commonplace, Hayes has introduced its new V-series of 2,400- and 9,600-bps modems. While other companies have been making 9,600-bps modems for the PC market for the past year or so, all these modems could only run at top speed when the same model was at both ends of the telephone line. Many PC users have been waiting to see what Hayes would do, hoping that it could establish a standard.

While Hayes did define the standard for the software interface for auto-dial modems, the actual communications standards for the current generation of modems have been set either by AT&T (the BELL 212 standard used for 1,200-bps data) or the CCITT, an international committee of telephone operating authorities (the V.22 bis standard used for 2,400-bps modems). Unfortunately, AT&T is no longer in a position to define standards, and while the CCITT has defined two different standards for 9,600-bps modems (V.29 for half-duplex modems and V.32 for full-duplex modems), neither of these standards truly fits the needs of PC users.

Low-speed (lower than 2,400 bps) modems send data in both directions by using different carrier frequencies for each direction. Since the telephone line doesn't have enough bandwidth to carry 9,600-bps data on

(continues on page 35)

HP's PaintJet Prints Seven NLQ Colors and 330 Low-Res Shades

PC HANDS ON

BY MITT JONES

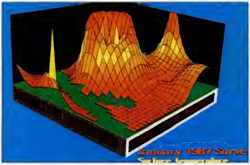
Hewlett-Packard Co. changed the PC landscape with the high-quality print and graphics in its LaserJet series. Now, HP's newest innovation gives you 330 preprogrammed graphics colors and seven colors of near-letter-quality (NLQ) text at a price that makes eye-catching business reports affordable.

Dubbed the HP PaintJet, the printer costs $1,395, occupies little desktop real estate, and will be among the more quiet workers in your office.

The mess-free ink cartridges and built-in cartridge primer and wiper eliminate the mess and smearing of ink jet printers past.

The PaintJet employs one black and one three-color ink cartridge with built-in print nozzles to perform its magic. Aside from black, the cartridges produce only six colors of dots: cyan, magenta, and yellow ink overlay to form red, green, and blue. Printing in only these col-

(continues on page 36)



This three-dimensional graph was composed in Boeing Graph *and printed on the PaintJet in its low-resolution (90 dpi) mode.*

HANDS-ON INDEX

First VGA Board for XTs, ATs: Pretty Colors and Rough Edges

HANDS ON

BY MITT JONES

The wait for the first XT/AT-compatible VGA adapter board is over: STB Systems' VGA Extra provides all the new modes of IBM's Video Graphics Array standard plus a few capabilities IBM left off.

Rather than wait for one of the chipset makers to complete a VGA chipset, STB built the VGA Extra around two chips from the Chips and Technologies EGA chipset and added VGA abilities on its own.

STB advertises the VGA Extra board as being only BIOS-level compatible with the IBM VGA but claims that the VGA Extra is nearly register-level compatible as well. Differences in the number of bits that are used to switch from EGA to VGA modes, for example, prevent STB from advertising the adapter board as register-level compatible.

Occupying a full-length slot, the adapter includes a 9-pin port for digital monitors and a 15-pin, PS/2-style port for analog monitors and can drive just about any PC monitor. Of course, on a monochrome display, you're limited to text modes and two gray-scaled graphics modes, and you'll need an IBM PS/2 analog monitor or a multiscanning monitor to display the full range of VGA modes.

But don't write out your check yet. Though the VGA Extra's performance rates no less than dazzling at times, overall performance was disappointing. The board revealed troublesome quirks regardless of which monitor I connected.

Driving an IBM analog monitor in 256-color mode, the VGA Extra generated a display indistinguishable from the IBM VGA, including deep, brilliant colors and fuzzy text. However, the Extra showed problems when changing display modes and operating within certain modes.

For instance, after changing to the 256-color VGA mode from EGA's 64-color mode in *Show Partner F/X*, spurious vertical bars stretched across the bottom of the screen. Mode changes in general caused a small amount of snow and flicker and often changed the vertical size of the display, though this was little more than an annoyance with the analog monitor.

Operating in four-color CGA mode (mode 4), the Extra consistently displayed the wrong background color, sometimes changing the background color for no apparent reason. The monochrome modes, such as mode 7, gave the Extra the most trouble of all, often rendering a blank screen. Running a Setmode utility that STB provides finally allowed me to reproduce IBM VGA results in two of the monochrome modes, but one mode still didn't display properly.

Results with a NEC MultiSync in analog mode were even more problematic. The display was crisp, but the Extra showed the same quirks as with the IBM analog monitor, plus a few more.

During mode changes the display sometimes shifted partially off the screen horizontally and changed size vertically and horizontally, often prompting me to adjust the picture manually. Some modes occasionally caused the screen to scroll vertically, though that, too, could be corrected.

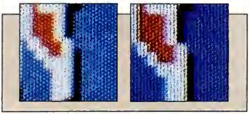
This erratic behavior is due largely to the design of the MultiSync and some other multiscanning monitors, which in general were not designed to operate at VGA frequencies. The IBM VGA subsystem also incorporates a video return signal to keep signals in sync during

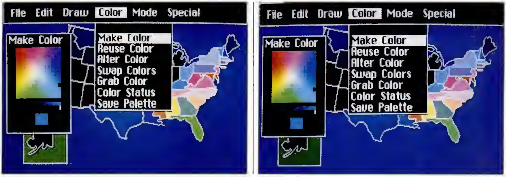
(continues on page 36)

PC MAGAZINE FACT FILE

VGA Extra
STB Systems, Inc.
1651 N. Glenville
P.O. Box 850957
Richardson, TX 75085-0957
(214) 234-8750
List Price: $495
In Short: A BIOS-level compatible VGA board for XTs, ATs, PS/2 Model 30s, and compatibles; generates brilliant colors but could not consistently generate the correct colors.

CIRCLE 441 ON READER SERVICE CARD





An IBM PS/2 (left) and the STB VGA Extra board driving a NEC MultiSync monitor in an AT (right) display the same Show Partner F/X *screen in the VGA's 256-color mode. IBM's analog monitor displays richer, brighter colors, but the NEC MultiSync monitor produces a sharper image. When we drove the PS/2 analog monitor with STB's VGA Extra board (not shown), it generated an image that is equivalent to the PS/2 screen on the left. Above, each image is magnified 16 times.*

V-series

(continued from page 33)

more than one carrier, V.32 modems require complicated echo cancellation circuits so they don't misinterpret the data they are transmitting as part of the data they should be receiving. V.32 modems cost between $2,500 and $5,000.

What Hayes has now done to create 9,600-bps modems for the PC at a reasonable price is to add buffers to the V.29 half-duplex standard, so that while data is going in only one direction at a time, the modem's internal buffers allow communications between the modem and the PC to continue as if the link were bi-directional.

In its new V-series Smartmodem 9600, Hayes has added several enhancements: trellis coding, which improves a modem's line noise immunity; a fast line turnaround algorithm to improve the response in true full-duplex applications; adaptive data compression to further improve throughput; and LAP-B error correction. LAP-B, the error-correcting method used on X.25 networks, is a block error-checking protocol that automatically corrects any transmission errors without any action by the computers involved. The V-series modems also speed up transmission by sending the data across the phone line in synchronous mode, saving the overhead of having to send start and stop bits for each byte.

Hayes is making some of these features available for 2,400-bps communications; you can add a Modem Enhancer to an existing Hayes Smartmodem 2400 or buy the new V-series Smartmodem 2400. Both give you on-line data compression and error correction.

In our testing, the V-series modems performed flawlessly, transmitting data faster than the comparable US Robotics Courier HST. The V-2400 was particularly impressive, and under some conditions it was fully twice as fast as the normal Smartmodem 2400. Because the Enhancer adds data compression, the greatest improvements were on text files; binary and compressed files showed a lesser degree of improvement.

The only problem with the V-series is that you need V-series modems at both ends of the line to take advantage of their features. They are recommended if you have point-to-point communications needs.

It's too early to say whether Hayes has now set the standard for 9,600-bps PC communications, but it's certainly made a good contribution to a confused situation.

PC MAGAZINE FACT FILE

V-series Smartmodem 9600
V-series Smartmodem 9600B
V-series Smartmodem 2400
V-series Smartmodem 2400B
V-series Modem Enhancer
Hayes Microcomputer
Products Inc.
705 Westech Dr.
Norcross, GA 30092
(404) 449-8791

List Price: V-series Smartmodem 9600, $1,299; V-series Smartmodem 9600B, $1,199; V-series Smartmodem 2400, $899; V-series Smartmodem 2400B, $849; V-series Modem Enhancer, $349.

In Short: Hayes made data compression and error correction available for Smartmodem 2400s at the same time it introduced a 9,600-bps modem that uses a superset of these features. Unfortunately you need them at both ends to take advantage of these new features.

CIRCLE 440 ON READER SERVICE CARD

New Specs for LIM Expanded Memory Allow TSR Programs to Run Above 640K

PC PREVIEW

BY GUS VENDITTO

Lotus, Intel, and Microsoft unveiled enhancements to the expanded memory specification (LIM EMS) that will give software developers 15 new functions to use in writing programs that can access EMS. Other leading PC software publishers—including Borland, Ashton-Tate, and WordPerfect—said they will implement the new specs in future versions of their programs.

Among the enhancements to LIM EMS 4.0:

- RAM-resident programs can run in expanded memory.
- EMS can have access to 32 megabytes instead of 8.
- Programs, utilities, and data can share EMS; currently, only one use of expanded memory at a time is possible.
- Data can remain alive in expanded memory during a warm boot.

Current EMS- and EEMS-compatible memory boards will run Version 4.0. However, new drivers will be needed, and applications will need enhancements to use the new features.

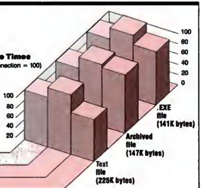
Intel will supply new drivers free to Above Board owners starting September 30; call (800) 538-3373 to request a copy, or download it from the Intel bulletin board at (503) 629-7348 (set your modem at 1,200 or 2,400 bps; 8,N,1).

Performance Tests: Hayes V-series Smartmodem 9600 vs. U.S. Robotics Courier HST and a direct connection

Hayes's V-series modems use on-the-fly compression, so the Smartmodem 9600 offered significant improvement over both a direct connection and the U.S. Robotics 9,600-bps modem on an ordinary text file. On compressed and binary files, Hayes's compression technique had less effect.

Performance Times
(Times given in seconds/kilobyte transmitted)

	Text file (255K bytes)	Archived file (147K bytes)	.EXE file (141K bytes)
Direct connection	1.10	1.09	1.10
U.S. Robotics Courier HST	1.31	1.33	1.35
Hayes V-seriee Smartmodem 9600	0.92	1.27	1.15



These performance tests of 9,600-bps modems used a TAS Voiceband Channel Simulator and modem tester to create a controlled line condition. The direct connection consisted of null modem connections at both ends; in each test of a modem, the same model was used at both ends of the connection. Files were sent via *Crosstalk Mark IV* between two 8-MHz IBM PC ATs at 9,600 bps using the Ymodem-G error-correcting protocol. The text file consists of several articles that appeared in *PC Magazine*. The archived file is the .ARC version of the Qmodem communications program. The .EXE file is a compiled *Clipper* database program.

PaintJet

(continued from page 33)

ors produces sharp seven-color graphics and text at a resolution of 180 dots per inch.

The PaintJet simulates the remaining colors by coloring two- by two-dot "super pixels" with different combinations of the seven dot colors and white (no ink at all), giving an effective resolution of 90 dpi.

I disqualified about 45 colors from the printer's 330-color spectrum for being indistinguishable from other colors, and many of the colors appear grainy up close. But, nit-picking aside, the results are impressive.

You can access any of the printer's 330 colors via standard RGB coordinates that the documentation clearly lists. However, you can have only 16 colors in the palette at a time, limiting you to 16-color output for all practical purposes. Software vendors can get around this limitation when developing drivers, but so far few have bothered.

Hewlett-Packard lists 55 software packages, encompassing the majority of the popular business applications, that will soon drive the PaintJet. However, most of the packages listed so far will support only 8 to 15 of the PaintJet's colors. Eight colors will suffice for most business users, but the artistically inclined will have to wait for more-ambitious drivers.

Though text print quality and speed fall far short of laser printer standards, the PaintJet holds its own against low- to mid-priced dot matrix printers. We clocked print speed at 78 characters per second in the default 10-character-per-inch font.

The PaintJet prints a full page of color graphics in about 4 minutes. To print transparencies, you have to switch to a double-inking mode that takes roughly twice the time.

The PaintJet, which measures 18 inches across and weighs only 11 pounds, boasts a built-in ink-cartridge primer (upper left) and a cartridge wiper (located on the carriage lid, lower right) to help eliminate nozzle clogs and keep the ink off your hands. After priming and wiping the cartridges, you simply slide them into the carriage (lower right).

You can use any tractor-feed or single-sheet paper with the PaintJet, but you'll have to dish out $17.95 ($15.95 by the case) per 250-page pack of specially-coated paper to get vibrant colors. Ink cartridges will cost you $27.95 for black and $34.95 for color, rated respectively for 1,100 and 180 pages.

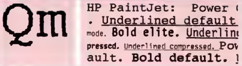
The PaintJet won't drive slide makers or plotter manufacturers out of business: the transparency mode doesn't produce colors as vibrant as you'd want for formal presentations, and even on paper the color graphics lack the resolution and color consistency some situations demand. But the PaintJet's price, wide range of colors, and NLQ text make it an attractive choice for sprucing up internal presentations and reports.

All in all, its intelligent design, generous range of features, and HP label make the PaintJet perhaps the first color graphics printer likely to find its way onto many a businessperson's desk. Add it to your wish list.

List Price: HP PaintJet, $1,395. Hewlett-Packard Co., 1820 Embarcadero Rd., Palo Alto, CA 94303; (800) 752-0900.

CIRCLE 439 ON READER SERVICE CARD

HP PaintJet



Qm

HP PaintJet: Power
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mode. Bold elite. Underlin
pressed. Underlined compressed. Pow
ault. Bold default.

Type: Color ink jet
Carriage width: 9¾ in.
Price: $1,395
SPEED (cps):
  Rated: 167
  Default: 78
Type pitches (cpi): 10, 12, 18
SOUND LEVEL (decibels):
  Rated: 50
  Tested: 50

FEATURES:
  Printing: NLQ, seven text colors, bold, underline, compressed
  Formatting: Variable form length, variable line height
COMPATIBILITY:
  IBM character set: Low and high
  Graphics: HP ThinkJet (HP PCL Level 1 printers)
  Text: HP ThinkJet (HP PCL Level 1 printers)

VGA Extra

(continued from page 34)

mode changes, a feature multi-scanning monitors lack.

Even running the MultiSync in digital mode, the VGA Extra revealed problems. PC Labs tests revealed spurious vertical white lines in Modes 0 and 1—both 16-color modes. STB said that it will correct the problem in later versions.

In addition to the collection of mode-setting routines, STB includes high-resolution drivers for *1-2-3*, *Microsoft Windows*, and *AutoCAD*. The 132-column, 44-row *1-2-3* driver worked beautifully with the MultiSync but would not work with the IBM analog monitors. The 752 by 410 *Windows* driver enlarged the MultiSync display so much that I couldn't adjust it to fit completely on the MultiSync's screen.

STB deserves credit for getting the first VGA board on the market. And the board's nice performance—once settled into a VGA display mode—almost made me forget its quirks. But unless you can't bear to wait a couple of months for VGA graphics, settle back to see what the competition has to offer.

Lack of register-level compatibility won't cause you much grief now, but it may limit you in the future, when at least some applications packages are likely to program VGA registers directly. PC

Fraud Hooks Readers with Low Prices

A con artist recently set up a dummy corporation, Compusystems Co., and placed ads in several computer magazines, including *InfoWorld*, *Byte*, and *OnLine Today*, featuring a wide range of the most popular PC products.

The ads featured prices roughly one-third less than current discounters (for example, *WordPerfect* 4.2 was advertised for $142 and NEC's MultiSync monitor for $389) and drew many orders from readers who complied with the ad's terms of prepayment by check only. Although the checks were cashed, none of the orders were filled, and the company's principals have disappeared.

Federal authorities are investigating the elaborate fraud, which included submission of phony bank records to these publications in order to establish a credit history, and calls to the magazines' offices via cellular phone.

PC Magazine received an ad order from Compusystems, but did not publish the ad.

On page 500, *PC Magazine* prints an outline of federal regulations on mail-order sales and advice on protecting yourself when ordering by phone or mail.—**Catherine D. Miller**

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- ☐ 190WT Power Supply
- ☐ Hardware Reset Switch
- ☐ Enhanced Keyboard (101 Keys)
- ☐ Complete Documentation
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$999 Protegé Base System

MONO SYSTEMS

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w/ 60MB **$2099**

EGA SYSTEMS

14" Hi-Res Monitor and
EGA Graphic Card **$1599**
w/ 20MB **$1899**
w/ 40MB **$2099**
w/ 60MB **$2499**

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CIRCLE 353 ON READER SERVICE CARD

PFS:First Publisher: $99 Page Design

HANDS ON

BY JONATHAN MATZKIN

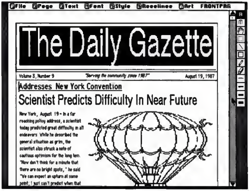
Desktop publishing perks up everything from notes to newsletters. But for most users, the cost of the $800 software and extensive training needed to use it present an insurmountable obstacle. Software Publishing Corp.'s *PFS:First Publisher* lowers those barriers by a considerable degree.

For only $99, the package offers a feature-packed, relatively easy-to-use route to lively documents. And it produces good-looking output from ordinary dot matrix printers, HP-graphics-compatible laser printers, and PostScript printers.

You construct *First Publisher* documents in two distinct phases—text and graphics. The documentation encourages you to think of text and graphics as two separate "overlays" that are combined to form a complete page.

That means you if you've botched the layout of your page's graphic elements, you can start from scratch without losing all the work you did on the text portion.

First Publisher comes with four nice-looking typefaces, available in a variety of point sizes and styles. Additional fonts are available in two add-on libraries that cost $39 each, but it would have been nice to see more standard fonts.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Page
Text
Font
Style
Baselines
Art
FRONTPAG
The Daily Gazette
Volume 3, Number 9
"Serving the community since 1987"
August 19, 1987
Addresses New York Convention
Scientist Predicts Difficulty In Near Future

New York, August 19 - In a far reaching policy address, a scientist today predicted great difficulty in all endeavors. While he described the general situation as grim, the scientist also struck a note of cautious optimism for the long term. "Now don't think for a minute that there are no bright spots," he said. "We can expect an upturn at some point; I just can't predict when that

PFS:First Publisher *comes with a set of layout templates that simplify document design. Unfortunately, the templates have to be modified for use with some printers.*

Software Publishing also sells five clip-art packages (also $39 each) that supplement the drawing library that comes with *First Publisher*.

Unfortunately, you cannot conveniently scan the available fonts and art elements. Fonts must be written to the screen for examination; groups of art elements are stored in several files that must be individually called up and viewed.

One of *First Publisher*'s greatest strengths is a series of layout templates that guide new users. Layout is an acquired artistic skill, and the templates provide a good starting point for a variety of documents, including newsletters and invoices. Unfortunately, in unmodified form the templates do not support all printers. They work fine with Panasonic's KX-P1091i printer but won't print properly on an IBM graphics printer.

First Publisher has a graphical interface. While all commands are keyboard accessible, the program is completely mouse driven.

First Publisher is a bit memory hungry (it requires 512K bytes of free RAM), and it really should be run on an AT. It works fine on an XT, but some operations are noticeably slow. It will never challenge *PageMaker* or *Ventura Publisher*, but *First Publisher* could bring powerful capabilities to a whole new class of users.

FACT FILE

PFS:First Publisher
Software Publishing Corp.
1901 Landings Dr.
P.O. Box 7210
Mountain View, CA 94039
(415) 962-8910
List Price: $99; additional font and art packages, $39.
Requires: 512K RAM; two disk drives; CGA, EGA, or Hercules graphics adapter; dot matrix or laser printer; DOS 2.0 or later.
In Short: An inexpensive desktop publishing system for small jobs. Not copy protected.

CIRCLE **432** ON READER SERVICE CARD

R:Tools: Don't Use R:base Without It

HANDS ON

BY NEIL J. RUBENKING

The wizards at Microrim have opened their toolboxes for us, revealing *R:base* utilities they created for their own use. Some analyze your database from the DOS level, others work within *R:base*, and still others are file-manipulation tools.

Trying to fix a damaged database without these tools is just short of impossible.

The most valuable pair of utilities is RBCHECK and RBPATCH. The first is for problems in a database; the other lets you repair them and even undelete a deleted record.

APSCAN checks your applications for correct IF and WHILE nesting and creates a cross-referenced list of variables. You can direct it to make a clean copy of your application, properly indented and reorganized for clarity. Unfortunately, APSCAN doesn't check for errors other than bad IF and WHILE nesting. For example, it wouldn't catch "WHITE .MyHeader" instead of "WRITE .MyHeader."

Besides these essential utilities, you get command files and function-key definition maps. Other command files sort your forms and reports for faster access and document your database internally. The key redefinition maps assign sets of standard commands to the Alt-function keys.

R:Tools also provides 13 DOS-level tools for file management. These include file backup and restore, locating files on a hard disk, a global text changer that works on multiple files, and more.

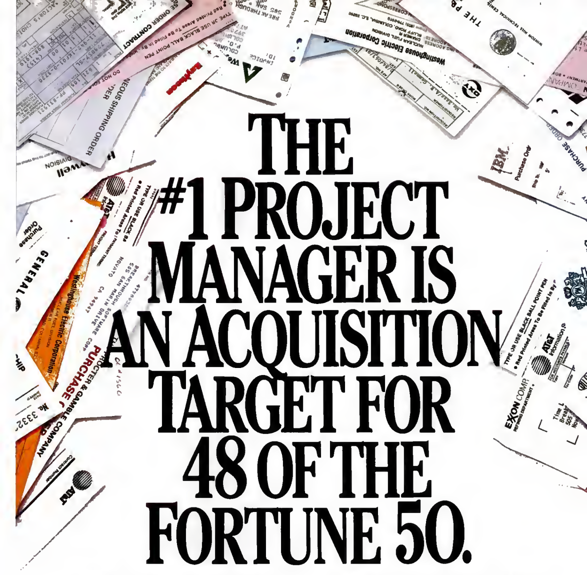
RBCHECK, RBPATCH, and APSCAN alone are worth the price of this utility set. The detailed description of the file structure that you get in the documentation is priceless!

Every *R:base* programmer will want *R:Tools.*

FACT FILE

R:Tools
Microrim
P.O. Box 97022
Redmond, WA 98073-9722
(206) 883-0888
List Price: $99; available only to registered users of *R:base System V* or *R:base Series 5000.*
Requires: *R:base System V* or *R:base Series 5000.*
In Short: A set of unique tools for *R:base* programmers.

CIRCLE **442** ON READER SERVICE CARD



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>
> *PC WEEK*

Dac-Easy Accounting has everything you need to run your business at peak efficiency. Seven accounting modules are perfectly integrated in one system: General Ledger, Accounts Payable, Accounts Receivable, Inventory, Purchase Order, Billing and Forecasting. Data entered once is automatically posted to all modules.

And Dac-Easy provides sample Chart of Accounts which most businesses can use with little or no modification.

> *"While other companies try to market old technology at new prices, Dac offers you new Dac-Easy Accounting 2.0. With modern interface and fast, easy performance, it's the best of today's technology. Start 1988 right. Get the best and say no to repackaged, repriced old technology."*
>
> *KEVIN HOWE, PRESIDENT*
> *DAC SOFTWARE*

Version 2.0 is multi-company, multi-departmental. It provides over 700 management reports. Records three-year history. Makes billing fast and simple for service or inventory based companies. Supports point-of-sale invoicing. Offers complete financial analysis. Includes on-line and batch processing. And much more. Plus, free start-up support is available for first time users.

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> *PC WORLD*

> *"The nation's top-selling accounting program. A flexible, inexpensive package with many unexpected features; surpasses the original version in look, organization, and ease of use. Dac-Easy Accounting continues to have a lineup of extras you'd expect to find only in expensive, high-end programs."*
>
> *PC MAGAZINE*

Our other Version 2.0 products can make the accounting process even easier for your company. Dac-Easy Mate allows you to view accounts, customer, product or vendor files on screen and print to screen; plus it has a fast backup utility that compresses your files without leaving the program. With Dac-Easy RePort you can quickly create custom reports, plus port any file to spreadsheet or database. Accounting Tutor includes a fast primer on accounting for your company, illustrations of the many types of management reports, and step-by-step examples of common business uses.

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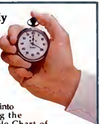
Now, the only full featured accounting system you can set up & begin using in minutes.



1. Turn hours into seconds by using the optional sample Chart of Accounts. It contains over 255 accounts and is fully modifiable.

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> *"Dac-Easy Payroll . . . not only manages payroll, but assists in keeping track of personnel. It rates a 'best-buy.'"*
>
> *IEEE SOFTWARE*

> *"I've seen payroll packages selling for $500 and up . . . this program is just as good."*
>
> *IN BUSINESS*

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You'll have quick access to vital information on employees. Like hire or termination dates, overtime, raises, reviews, vacation time, birthdays, sick leave, etc. Using Dac-Easy Payroll, you'll be able to create custom reports from such data to help you manage personnel even better. And Payroll Tutor provides a primer plus examples of management reports and everyday applications.

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Dac-Easy Word II is a snap to install and even easier to use. It has a 90,000 word spell checker/dictionary with word search option, mail merge database, pull down menus, speed keys for power users, gratifyingly fast editor, complete windowing (up to four on one screen), automatic hyphenation, automatic headers and footers, full featured block command menu, context-sensitive help, and supports well over 200 printers.

> *"For reasons above and beyond the price, Dac-Easy Word II is immediately likable . . . The program abounds with conveniences characteristic of its more expensive counterparts."*
>
> *PERSONAL COMPUTING*

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An exceptionally easy, fantastically flexible, amazingly affordable database.

Using Dac-Easy Base, you can quickly organize, locate, and sort all types of alphabetic and numeric data. Like birthday or Christmas card lists, menus, inventories, addresses and phone numbers, etc. Designed for the beginner, Base has many power features, too! You can maintain unlimited number of records with up to 60 fields per record. Base includes programming language, MemoWriter, full reporting, dBase II compatibility, and more.

> *"Dac-Easy Base is similar to dBase II in appearance, yet it improves upon it in ease of use, system limits, on-line help . . . and screen report layouts. The entire package is eminently user friendly."*
>
> *PC MAGAZINE*

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Minimum Hardware Requirements: All Dac-Easy products run on IBM PC or compatibles, 2 disk drives, MS-DOS or PC-DOS 2.0 or later. 80 column printer able to print 132 column in compressed mode, color or monochrome monitor. 256K memory (Mate requires 384K). Trademarks. IBM PC-DOS, MS-DOS, dBase II. Dac-Easy trademark of Dac Software, Inc., 4801 Spring Valley Rd., Bldg. 110-B, Dallas, TX 75244 (5¼" & 3½" Disks available.)

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CIRCLE 149 ON READER SERVICE CARD

MemoryMate Notepad Indexes Each Word

HANDS ON

BY JARED TAYLOR

MemoryMate is the computer equivalent of the little notes that clutter your desk. It is the perfect way to store the random information that runs your life: names, numbers, appointments, grocery lists, and so on. It is actually a RAM-resident database manager, but it's so fast, flexible, and easy to use that it feels a lot more like *SideKick* than *dBASE*.

Like all databases, *MemoryMate* stores information in records. When you call up the program you get a mostly blank screen, in which you type in what you want to remember. You don't have to worry about fields, keywords, or predefined structure. Whatever you enter becomes a record. The only limit is that a record can't be more than 60 lines long.

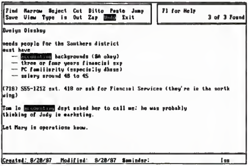
When you save a record, *MemoryMate* indexes every word. That means that you can find a record by hunting for any distinctive word in it. If, for example, you need the address of a store that sells modems, you could search the database for "modems" even if you don't remember the name of the store, its owner, or anything else about it. So long as the word "modems" is in the record, *MemoryMate* will find it.

If there are a lot of records about modems, *MemoryMate* shows you the first one and tells you how many more there are. You can then page through them or run a second, narrower search if there are too many.

MemoryMate lets you search by AND and OR combinations, as well as by the date a record was written or last changed. It also has a tickler feature to make a record pop up automatically on a certain date the first time you use *MemoryMate*. You can read ASCII files in and out of it or cut and paste screen contents from other programs.

Whether you use *MemoryMate* as a TSR program or as a standalone, it uses only 82K bytes of RAM because it stores all records on disk.

MemoryMate is no substitute for a serious database. But it's an ideal way to keep on top of the information you need every day.


Find Narrow Select Cut Ditto Paste Jump
Save View Type in Out Zap Undo Exit
F1 for Help
3 of 3 Found

```
Evelyn Oisskey

needs people for the Southern district
must have
   — accounting backgrounds (BA okay)
   — three or four years financial exp
   — PC familiarity (especially dbase)
   — salary around 40 to 45

(718) 555-1212 ext. 418 or ask for Fiancial Services (they're in the north
wing)

Tom in accounting dept asked her to call me: he was probably
thinking of Judy in marketing.

Let Mary in operations know.

Created: 8/20/87  Modified: 8/20/87  Reminder:                    Ins
```

One of two MemoryMate *records retrieved by a search for "accounting". The program's command menu is always on-screen. A command is selected by hitting a combination of the Ctrl key and the first letter of the command.*

FACT FILE

MemoryMate
Broderbund Software Inc.
17 Paul Dr.
San Rafael, CA 94903-2101
(415) 492-3500
Requires: 82K RAM, two floppy disk drives, DOS 2.0 or later.
List Price: $69.95
In Short: A fast, RAM-resident *or* standalone, free-form note taker that lets you search for any word in any note. Previously published by the developer as *Instant Recall*. Not copy protected.

CIRCLE **433** ON READER SERVICE CARD

Triad Plus Locks Out Intruders and Keeps Audit Trail

HANDS ON

BY DONALD B. TRIVETTE

Triad Plus, the comprehensive security system from Micronyx, won't make your PC as impregnable as Fort Knox, but it will keep out anyone but the most highly trained CIA operative. Designed for an environment in which several users share a single PC, or in which multiple machines are protected by a central authority, Triad's integrated hardware and software offer a three-way approach to one of data processing's most daunting problems. First, it keeps unauthorized users from accessing a PC; second, it allows you to control the ownership of files; and third, it maintains an audit trail.

Triad comes to attention when you boot and it asks for multiple passwords and prompts you to insert a unique key, called a token. After three consecutive failures to enter the correct access information, the software locks you out for 5 minutes; after the sixth failure, the computer sounds an alarm through the PC's speaker and again locks you out.

Triad's hardware consists of a half-length board in whose memory both program code and access passwords are safely hidden from hackers who might otherwise try to crack identification codes by studying dumps of system RAM. The board is equipped with a metal hasp into which a padlock may be fitted to prevent its removal from the computer.

During installation, the security officer can specify which devices each level of user may access. There are eight levels.

The second part of the triangle is data security. Files may be public, restricted to a group of users, or completely your own. This is enforced by an encryption algorithm that codes and decodes all protected files prior to any application or DOS call. The lag is hardly noticeable—encryption is at a blistering 50K bytes per second.

The third leg of Triad's security is the detailed audit trail it keeps for all system activities, including both program executions and file openings. At the manager's option, the software can prompt for a project name and number to be used for client billing. Although Triad has primitive reporting capabilities, the data is easily processed by *1-2-3* or *dBASE III*.

Triad Plus is a first-rate, albeit expensive, security system. It is fast, efficient, and almost impossible to circumvent.

FACT FILE

Triad Plus, Version 1.10
Micronyx Inc.
1901 N. Central Expy., #400
Richardson, TX 75080
(214) 644-9613
List Price: $795
Requires: 192K RAM, one disk drive, DOS 2.1 or later.
In Short: A comprehensive security system to control hardware access and file access and to maintain an audit trail.

CIRCLE **431** ON READER SERVICE CARD

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PC/AT 10 MHz w/1024K, 1.2 Floppy Drive	$1039
PC/AT 10 MHz w/1024K, 1.2 Floppy, 40 MG	$1625
MonGraphics Card with Parallel Printer Port	$ 69
Color Card w/Parallel Printer Port	$ 65
Multifunction Card w/Software	$ 79
Amber Monitor (TTL)	$ 89
Amber Monitor w/Swivel Tilt	$ 99
AT Multi I/O Card	$ 69
Color Monitor (RGB)	$ 279
EGA Plus Card	$ 145
I/O Card (Serial/Parallel)	$ 38
I/O Card (Serial/Clock Calendar)	$ 39
Enhanced Keyboard	$ 69
XT Multi I/O Card	$ 55

HARDWARE

PRINTERS

Alps	
All Models	Call
Brother Printers	Call
Citizen Printers	
MSP-10	$ 269
MSP-15	359
MSP-20	309
MSP-25	459
Premier 35	445
120D	186
Diablo	
D-25	469
635	759
Diconics	
150	$ 299
Epson Printers	Call
Hewlett-Packard	
Laser Jet Series II	1829
NEC	
3510, 3550	729
8810, 8850	1059
P-6	429
P-7	619
P-9	1035
Okidata	Call
Panasonic	
1080 I	155
1091 I	169
1092 I	295
1592	375
1595	419
3131	229
3151	369
Star Micronics	Call
Toshiba	
321SL	509
341E	665
351 Model II	999
351 Color	1029

MONITORS

Amdek Monitors	Call
NEC	
Multisync	$ 549
Other Models	Call
Princeton Graphics Monitors	Call

BOARDS

AST	
Six Pack Plus	$ 139
Other Models	Call
ATI	
EGA Wonder	245
Hercules	
Color Card	145
Graphics Card	175
Graphics Card Plus	185
Intel	
Above Board PC	210
PS/PC	239
Above Board AT	315
Above Board PS/AT	345
Orchid	
Turbo EGA	449
Jet 386 Accelerator/AT	825
Tiny Turbo 286	399
Paradise	
Autoswitch 350	209
Autoswitch 480	285
5 Pack	86
Plus Development	
Plus Hard Card 20 Megabyte	609
Quadran	
Quad EGA Plus	295
Tecmar	
EGA Prosync	335
Graphics Master	409
Captain (No Memory)	109
Video-7	
Vega Deluxe	285

COMPUTERS

AST	
Model 80	$1399
Model 120	2099
Model 140	2449
NEC	
Multispeed	1339
Panasonic	
Business Partner	719
Sr. Partner	969
Exec. Partner Dual Drive	1429
Toshiba	
T-1100 Supertwist	Call
T-3100	Call
Wyse	
286	1729

MODEMS

Data Fox	$ 80
Hayes	
300	129
1200	296
1200B	259
2400B	405
Prometheus	
1200B w/Software	125
Other Models	Call
US Robotics	
Password 1200	149
Courier 2400	335
Microlink 2400	335

TERMINALS

Qume	
101 Plus Green	$ 315
101 Plus Amber	315
Wyse	
30	285
50	359
75	565
85	425

DISK DRIVES

Bernoulli Box	
10 Meg	$ 865
20 Meg	1199
40 Meg	1729
Segate	
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Teac	
1.2 MEG AT	125
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XyWrite III Plus: A Fast Speller Added to The Reigning Word Processor Speed King

PC HANDS ON

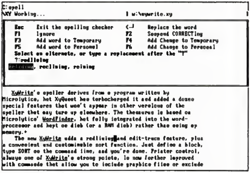
BY EDWARD MENDELSON

XyWrite has always been the word processor that lets you write as quickly as you think. In *XyWrite III Plus*, the latest upgrade from XyQuest, a new spelling checker, thesaurus, and other ingenious features almost allow the program to do your thinking for you.

Loyal *XyWrite* users would be wise to upgrade immediately. This new version includes many of the conveniences that users have been demanding for years, in implementations that are probably better than any that users have dreamed of.

The spelling checker is faster and smarter than those in all other word processing packages. Until now, you could find its features only by combining three or four separate programs. The spelling checker checks words, blocks, or documents while you work. It can even check huge batches of documents while you get a cup of coffee, and when you come back, it presents you with a separate file listing all misspellings. You can mark the necessary corrections in this list and let *XyWrite* fix the original files in the same automatic way it checked them, or you can go back and make changes interactively. You can also make the spelling checker resident in memory so that it beeps when you misspell words, silently corrects your most frequent typing errors, or automatically expands abbreviations as you type.

XyWrite's spelling checker is derived from a program written by Microlytics, but XyQuest has turbocharged it and added a dozen special features that won't appear in other versions of the spelling checker that may turn up elsewhere. The thesaurus is based on Microlytics's *WordFinder* but is fully integrated into the word processor and kept on disk (or a RAM-disk), rather than using up memory.



```
C:spell
\XY Working...                                        1 w:\xywrite.xy

     Esc     Exit the spelling checker     <┘      Replace the word
     F1      Ignore                        F2      Suspend CORRECTing
     F3      Add word to Temporary         F4      Add Change to Temporary
     F5      Add word to Personal          F6      Add Change to Personal
     Select an alternate, or type a replacement after the "?"
     ?:redlieing
    redlining, reclining, relining

     XyWrite's speller derives from a program written by
Microlytics, but XyQuest has turbocharged it and added a dozen
special features that won't appear in other versions of the
speller that may turn up elsewhere. The thesaurus is based on
Microlytics' WordFinder, but fully integrated into the word-
processor and kept on disk (or a RAM disk) rather than using up
memory.
     The new XyWrite adds a redlining and edit-trace feature, plus
a convenient and customizable sort function. Just define a block,
type SORT on the command line, and you're done. Printer control,
always one of XyWrite's strong points, is now further improved
with commands that allow you to include graphics files or exclude
```

XyWrite*'s new spelling checker is the same program from Microlytics that is used by other word processors, but XyQuest turbocharged it and added features.*

The new *XyWrite* adds a redlining and edit-trace feature, plus a convenient alphabetical sort function. Just define a block, type SORT on the command line, and you're done. Printer control, always one of *XyWrite*'s strong points, is now further improved with commands that allow you to include graphics files or exclude non-printing notes.

XyWrite is about to lose its reputation for getting into fights with memory-resident programs. Through a complete overhaul in its keyboard handling, *XyWrite* now coexists peacefully with just about any TSR program you can throw at it. Except in very rare instances, you won't need the separate keyboard-handling XYKBD.COM that was often required with earlier versions.

XyWrite III Plus retains the powerful no-nonsense style of its predecessors. Virtually all commands are entered as two-letter mnemonics at the top of the screen, and there's scarcely a menu in sight. Although some well-written tutorial booklets smooth out the learning curve, this is still a program designed for people who expect to give it heavy use and are willing to take the time to learn it.

The rewards justify the effort. Functions such as search and replace, reformatting, and file saving act so quickly that new users often can't believe that anything has happened at all. If you want to open a file but can't remember its name, *XyWrite* will search the whole disk in seconds for any word you choose. You can keep nine windows open at once. The program does not look graceful on-screen, and no one has ever praised the logic of its default keyboard layout, but once you understand how to pilot this program, it lets you fly.

The program is completely adaptable. If you don't like the way it does something, change it. It's surprisingly easy to redefine every key on the keyboard or add dozens of functions to the ones included in the default layout. And if you can't find the function you need in *XyWrite*'s tool kit, you can try to do the trick using *XyWrite*'s own programming language.

XyWrite captured the journalism and publishing market because nothing matches it for speed, power, flexibility, and its superb control over page layout. Its footnoting and cross-referencing capabilities have made major inroads in the academic and legal markets—partly in the form of Dragonfly Software's *Nota Bene*, which builds an elegant and elaborate chassis around the *XyWrite* engine. In its newest version, *XyWrite* now more than ever is the program for anyone who is serious about the written or printed word. PC

How to Make Over the XyWrite Screen

If you don't like the way *XyWrite* looks, change it. The uninformative CM, NM, and PRMPT in the header can be replaced with the current disk drive, path, and window number. Simply call up STARTUP.INT and add this line:

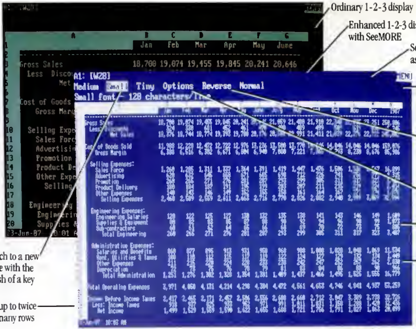
BC cm d,p,w

Don't try to type the bold BC directly into the file. It represents the *XyWrite* function code that takes the cursor to the command line. (This is the code mapped to the F5 key.) Previous versions let you add the code only by defining and copying one of the other BC codes already in the start-up file. But in *XyWrite III Plus* you can also go to the command line and enter PFUNC BC. The new Pfunc command inserts function codes directly into a file, so you no longer have to copy existing codes or turn on a special programming mode to access them.—**Edward Mendelson**

PC MAGAZINE FACT FILE

XyWrite III Plus
XyQuest Inc.
P.O. Box 372
Bedford, MA 01730
(617) 275-4439
List Price: $445 plus $5 shipping; upgrade from *XyWrite III*, $50; upgrade from *XyWrite II Plus*, $150.
Requires: 256K RAM (384K RAM for spelling checker), two disk drives, DOS 2.0 or later.
In Short: The fastest word processor now has a superb new speller. Not copy protected.

CIRCLE 421 ON READER SERVICE CARD


Ordinary 1-2-3 display
Enhanced 1-2-3 display with SeeMORE
See up to twice as many columns
Choose mixed font format (Top 3 lines big)
Choose normal or reverse video
Change colors
Print any compressed screen
No special hardware required
Switch to a new size with the push of a key
See up to twice as many rows
A1: [W28]
Medium Small Tiny Options Reverse Normal
Small font - 128 characters/line

Unretouched photo of EGA display

1-2-3 never looked so good.

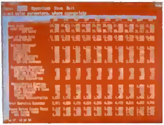
Introducing SeeMORE™, a powerful screen manager for 1-2-3® that expands your worksheet view with the push of a key. SeeMORE gives you a choice of compressed formats that double, triple or quadruple the number of cells displayed on the screen.

Install the SeeMORE program with 1-2-3 and you can build a twelve month forecast without stopping to scroll around. All twelve months appear on the screen. SeeMORE lets you see *the big picture.*

Switch to reverse video.

No special hardware is required to run SeeMORE. All you need is a CGA, EGA, VGA, Hercules or compatible graphics adapter.

SeeMORE manages the screen *without interfering with the normal operation of 1-2-3.* You can zoom in and out as you build and manipulate a worksheet – you don't need to exit 1-2-3 and switch to a new driver set! And SeeMORE lets you produce hardcopy printouts of any compressed screen with the push of a key.



Change background and foreground colors.

Get SeeMORE and expand your horizons. Works with 1-2-3 Rel 2 on the IBM PC, XT, AT, PS/2 and compatibles. $79.95. Not copy protected. Symphony version coming soon.

	CGA	EGA/VGA	Hercules
Normal	80 x 25	80 x 25	80 x 25
SeeMORE:			
• Medium	91 x 28	106 x 43	120 x 43
• Small	106 x 33	128 x 43	144 x 43
• Tiny	128 x 33	160 x 58	180 x 58

SeeMORE is another fine product from Personics, maker of the award-winning SmartNotes™ program.

SeeMORE™ for 1-2-3

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CIRCLE 282 ON READER SERVICE CARD

$79 PageMaker Templates: A Head Start in Newsletter Design

HANDS ON

BY DIANE BURNS
AND S. VENIT

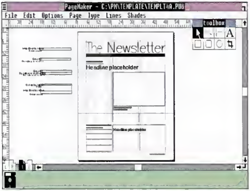
One of the criticisms leveled at desktop publishing has been that it puts graphics design tools in the hands of people who don't know the first thing about graphics design. In response to this criticism, Aldus Corp. offers help to those who need it with *PageMaker Portfolio: Designs for Newsletters*, the first in a series of *PageMaker* templates.

Templates are files that have the basic elements of a design, such as the margins, number of columns, and position of headlines and graphics already in place. These files can be opened and filled with your own text and graphics. Headlines and figure captions are provided in position; when these are selected and new text is typed in, the new text is in the correct font and position.

The package consists of seven template files, with two additional variations on each design. The templates include simple two-column layouts, as well as more-complicated layouts for three-, four-, and five-column newsletters. A tutorial, which takes less than an hour to complete, is provided with all the necessary disk files.

One of the most valuable parts of the newsletters package is the disk files. This book is much more than a manual for using the template files; it contains a wealth of information on the principles and mechanics behind good design. Topics discussed include an explanation of how copy fitting (counting up how much space a manuscript will require) is done by using traditional techniques, and how that applies to copy fitting electronically.

PageMaker Portfolio: Designs for Newsletters is an excellent investment for the desktop publisher who has never had any graphics design experience. The package provides a solid basis for layout, and is flexible and easy to use.



Called into PageMaker *directly from the portfolio of templates disk, this design is ready for enhancement and text merges.*

FACT FILE

PageMaker Portfolio: Designs for Newsletters
Aldus Corp.
411 First Ave. South
Seattle, WA 98104
(206) 622-5500
List Price: $79
Requires: 640K RAM, *PageMaker*, AT compatible, hard disk, DOS 3.0 or later.
In Short: A supply of 21 newsletter templates for use with Aldus's *PageMaker*; this is the first in a series. Not copy protected.

CIRCLE **434** ON READER SERVICE CARD

PageMaker on Video Is Slow Learning

HANDS ON

BY DEAN HANNOTTE

Aldus Corp.'s *PageMaker* is not just a new word processor, it's a whole new way to process words, and sooner or later everyone's going to want to learn what it's all about. *Aldus PageMaker on the IBM PC*—the new video training package from Computer Training Resources—offers a simple introduction to one of the most exciting programs in years.

Your on-screen tutor rehearses with blissful patience the procedures that will give you the same control of your document that a layout artist has over his pasteboard. Every 10 minutes you stop the video and do the related exercise in the workbook, using files on an accompanying disk or, optionally, the guidance of the audiocassette. The right-hand pages of the workbook describe these exercises, while the left-hand pages present additional "Tips and Explanations." This design is time-tested and works well with almost any topic.

A few caveats. Though powerful, *PageMaker* is easy to learn since it uses *Windows*, and most people who go through Aldus's own tutorial will get the idea soon enough. But if you find educational audiovisuals less than stirring, this product will add new dimensions to the word "boredom."

The instructor's view of *PageMaker* seems colored by the luxurious configuration of a hi-res 19-inch monitor and PostScript-propelled LaserWriter, which lead him to make several exaggerated claims that will not apply to everyone's setup (such as "Page enlargement and reduction in 1 percent increments gives you complete control over type sizes"). He also claims mistakenly that the paintbrush is the only icon for graphic images, that you can toggle only one of the five type styles at a time, and that you can't set the right indent in the Indents/Tabs dialog box.

As you walk through the workbook, expect to bloody your feet on shards of typos and grammatical errors. Although the workbook was prepared with *PageMaker*, it demonstrates poor paste-up technique, including the misalignment of adjacent text blocks and the overcropping of, among other things, the caption under the Crop illustration.

FACT FILE

Aldus PageMaker on the IBM PC: Beginning-to-Intermediate Level
Computer Training Resources Inc.
219 Ilihau St.
Kailu, HI 96734
(808) 254-6419
List Price: $129.95
Requires: *PageMaker* software installed; VHS player; audiocassette player.
In Short: A somewhat slow but instructive introduction to *PageMaker* using lessons on disk, video, and audio tape.

CIRCLE **435** ON READER SERVICE CARD

TO PASS ATs,™ JUST FLOOR OUR NEW TWIN TURBO 12™

PUT THE PEDAL TO THE METAL AT 12 MHz.

If you're about to soup up your PC, XT or 8088 clone, why settle for a single turbo? Orchid's new TwinTurbo 12™ will *double* turbocharge your PC. Making an ordinary accelerator's performance obsolete.

ONLY ORCHID'S 12-MHz TWINTURBO GIVES YOU DUAL TURBO POWER.

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The TwinTurbo 12 is compatible with all application programs for the IBM PC, XT and 8088-based clones—even 8-MHz imports. As well as network, multifunction, graphics and other add-on cards.

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TINYTURBO™	**$445**	**3 x PC**	**8 MHz** 80286	**No**

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12-MHz TWINTURBO 12™
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MIT Amber Monitor *With Swivel Tilt Stand*	MIT RGB Color Monitor	MIT Amber Monitor *With Swivel Tilt Stand*	MIT RGB Color Monitor
MIT I/O Serial/Clock Card	MIT I/O Serial/Clock Card	MIT AT Multi I/O Card	MIT AT Multi I/O Card
MIT 4 Outlet *Surge Suppressor*	MIT 4 Outlet *Surge Suppressor*	MIT 4 Outlet *Surge Suppressor*	MIT 4 Outlet *Surge Suppressor*

Turbo PC/XT w/640K & 1 Drive *with System Order Only*	$ 379
Turbo PC/XT w/640K & 2 Drives *with System Order Only*	$ 456
PC/AT 8 MHz w/1024K, 1.2 Floppy *with System Order Only*	$ 980
Turbo PC/XT w/640K & 1 Drive & 20 MG *with System Order Only*	$ 749
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PC/AT 10 MHz w/1024K, 1.2 Floppy 40 MG *with System Order Only*	$1566

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All Models	Call
Brother Printers	Call
Citizen Printers	
MSP-10	$ 269
MSP-15	359
MSP-20	309
MSP-25	459
Premier 35	445
120D	169
Diablo	
D-25	469
635	759
Diconics	
150	$ 299
Epson Printers	Call
Hewlett-Packard	
Laser Jet Series II	1829
NEC	
3510 3550	729
8810, 8850	1059
P-6	429
P 7	619
P-9	429
Okidata	Call
Panasonic	
1080 I	155
1091 I	169
1092 I	295
1592	375
1595	419
3131	229
3151	369
Star Micronics	Call
Toshiba	
321SL	509
341E	665
351 Model II	899
351 Color	1029

TERMINALS

Qume	
101 Plus Green	$ 315
101 Plus Amber	315
Wyse	
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50	359
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10 Meg	$ 865
20 Meg	1199
40 Meg	1729
Segate 20 MG w/WD Controller	339

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NEC	
Multisync	$ 549
Other Models	Call
Princeton Graphics Monitors	Call

COMPUTERS

AST	
Model 80	$1399
Model 120	2099
Model 140	2449
NEC	
Multispeed	1339
Parsonic	
Business Partner	719
Sr Partner	969
Exec Partner Dual Drive	1429
Toshiba	
T-1100 Supertwist	Call
T-3100	Call
AST	
Six Pack Plus	$ 139
Other Models	Call
ATI	
EGA Wonder	245
Hercules	
All Models	Call
Intel	
All Above Boards	Call
Paradise	
Autoswitch 350	299
Autoswitch 480	355
5 Pack	99
Plus Development	
Plus Hard Card 20 Megabyte	609
Quadran	
Quad EGA Plus	295
Tecmar	
All Models	Call
Video-7	
Vega Deluxe	285

MODEMS

Anchor Automation	
Anchor Express	$ 185
Hayes	
All Models	Call
Prometheus	
1200B w/Software	125
US Robotics	
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PFS Professional Write	89
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Word Perfect (Ver 4.2)	189
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Ventura Publishing	465

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Sony MD-2 (Qty 100)	89
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Sony 5 1/4	80

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Microsoft Access	137
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Smartcom II	79

INTEGRATIVE SOFTWARE

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Framework II	280
PFS 1st Choice	Call
Smart Software System 3.1	409
Symphony	439

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Microsoft Buss Mouse 6.0	103
Microsoft Chart 3.0	249
Microsoft Serial Mouse 6.0	115
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PC Mouse (New Ver)	89

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VP Planner	47

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UTILITIES

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Ryan McFarlan Fortran	339
Ryan McFarlan Cobol	539
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CIRCLE 123 ON READER SERVICE CARD

NEW ON THE MARKET

GRiD Laptop Features Two Full-Sized XT Expansion Slots and 20-Mbyte Option

Laptops offer much of the power, but little of the flexibility, of desktop systems. **GRiD Systems Corp.** has introduced the GRiDCase EXP, in an attempt to bridge this expandability gap. The 15-pound, $4,640 laptop accepts two standard XT-compatible expansion cards. This lets you configure the system as desired, without being limited by the availability of proprietary bus cards for the machine.

The $4,640 GRiDCase EXP laptop, from GRiD Systems Corp., features some system flexibility with slots for two standard XT-compatible expansion boards.

The basic system includes 640K bytes of RAM, a single 3½-inch, 720K floppy disk drive, and serial and parallel ports. The base unit also has an RGB color video port and a supertwist LCD. A 20-megabyte internal hard disk is available for $1,175, and a 2,400-bit-per-second modem costs $595. An optional gas plasma screen costs $530, and 1 megabyte of EMS RAM sells for $395.

List Price: GRiDCase EXP, $4,640; 20-Mbyte hard disk, $1,175; 2,400-bps internal modem, $595; gas plasma display, $530; 1 Mbyte EMS RAM, $395. GRiD Systems Corp., 47211 Lakeview Blvd., P.O. Box 5003, Fremont, CA 94537; (800) 656-4700.

CIRCLE **423** ON READER SERVICE CARD

GEM Scan Utility Edits Images and Runs Under Both Windows, GEM

Digital Research has unveiled *GEM Scan*, a scanner utility that runs directly from DOS or from graphical interfaces such as *Windows* and *GEM Desktop*. You can edit images by manipulating individual pixels or through rotation, inversion, or flipping of an image, without loss of resolution to the final scanned image. Customized images can be stored on disk for later use.

GEM Scan supports data image formats such as .IMG and TIFF, which are generated by graphical environments. This allows the program to work with desktop publishing applications such as *GEM Desktop Publisher*, Aldus's *PageMaker*, and Xerox's *Ventura Publisher*.

List Price: *GEM Scan*, $95.
Requires: 512K RAM, image scanner, hard disk drive, DOS 2.0 or later. Not copy protected. Digital Research Inc., P.O. Box DR1, Monterey, CA 93942; (408) 649-3896.

CIRCLE **428** ON READER SERVICE CARD

Expansion Unit Permits A Single Board to Fit In Toshiba T3100 Laptop

Connect Computer Co. has developed a compact expansion unit that allows the Toshiba T3100 laptop to accept standard PC expansion cards of two-thirds length or less. The WonUnder ($349) consists of two components: a card carrier that mounts on the T3100's bottom and an interface card that plugs into the laptop's expansion port.

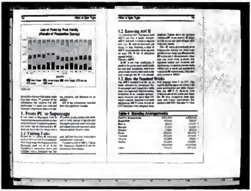
WonUnder allows the T3100 to take add-in cards of two-thirds length or less.

With the WonUnder mounted, the T3100 still fits into its case, according to Connect Computer.

List Price: WonUnder, $349. Connect Computer Co. Inc., 9855 W. 78th St., Eden Prairie, MN 55344; (612) 944-0181.

CIRCLE **430** ON READER SERVICE CARD

Maker of Superpage Debuts a Document Publishing System for Books and Catalogs



The Document Management System, *from Bestinfo, offers direct, WYSIWYG text and graphics editing on a 19-inch Moniterm Viking monitor.*

Bestinfo, maker of *Superpage* page-layout software, has introduced the *Document Management System* for designing large documents such as books, catalogs, reports, and manuals.

DMS is built around up to four networked PCs—two configured for editors and writers and two set up for illustrators and production staff. The production workstation contains the *Document Manager* publishing software that provides WYSIWYG page-layout tools, while the other workstations have software tool kits.

Prices for *DMS* range from $595 for the editor's tool kit to $8,000 for a full system, including all tool kits and the *Document Manager*.

Among its other capabiliby Jonathan Matzkin

ties, *DMS* can import tables from word processors or spreadsheets and manipulate them. Tables can be sized, converted to typographic format, and laid out over multiple pages with repeating heads. The system also supports complex pagination for handling floating pictures, tables, and footnotes.

DMS supports networks of up to 100 PCs and requires an AT compatible or 386 PC and a 19-inch Moniterm monitor.

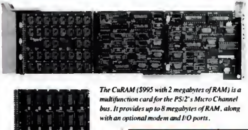
List Price: *Document Management System*, about $8,000. **Requires:** AT compatible or 80386 PC, 19-inch Moniterm Viking monitor.
Bestinfo Inc., 1400 N. Providence Rd., #117, Media, PA 19063; (215) 891-6500.

CIRCLE 424 ON READER SERVICE CARD

Add-In Boards Offer Large RAM Expansion For the PS/2 Machines

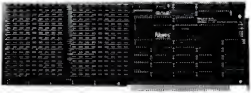
A major promise of the soon-to-arrive OS/2 is addressable RAM beyond DOS's meager 640K-byte limit. Expansion RAM for taking advantage of the new operating system will be available from **Newer Technology** and **Cumulus Corp.**

Newer claims its Concentration add-in card ($399 with no RAM) holds up to 32 megabytes of expansion memory on a single card without using piggyback boards. The card comes with either 256K-byte or 1-megabyte chips and operates with no wait states at up to 10 MHz. With one wait state, the card runs at up to 16 MHz.



The CuRAM ($995 with 2 megabytes of RAM) is a multifunction card for the PS/2's Micro Channel bus. It provides up to 8 megabytes of RAM, along with an optional modem and I/O ports.

You can define as much Lotus/Intel/Microsoft EMS, extended memory, or Vdisk memory as desired by simply changing the address, Newer says. The Concentration card has built-in parity checking and will be available for standard AT or Micro Channel buses.



The $399 Concentration add-in board, from Newer Technology, will have room for a whopping 32 megabytes of memory for the standard AT bus or IBM's new Micro Channel architecture in the PS/2 machines.

Cumulus offers the CuRAM card ($995 with 2 megabytes of RAM, $1,995 with 4 megabytes), which provides between 2 and 8 megabytes of memory for the Micro Channel bus. The card can also support an optional daughterboard with a $445 2,400-bit-per-second modem or $149 serial and parallel ports. The CuRAM implements all current memory standards, including extended, expanded, and enhanced expanded, in hardware.

List Price: Concentration, $399 with 0K RAM; with 8 Mbytes in 256K chips, $2,319; with 8 Mbytes in 1-Mbyte chips, $3,799; with 32 Mbytes, $13,999; EMS module, $150. Newer Technology, 251 Whittier St., Wichita, KS 67207; (316) 685-4904.

CIRCLE 425 ON READER SERVICE CARD

List Price: CuRAM, with 2 Mbytes RAM, $995; with 4 Mbytes, $1,995; optional modem, $445; optional I/O ports, $149. Cumulus Corp., 180 Basswood, Cleveland, OH 44022; (216) 247-2236.

CIRCLE 426 ON READER SERVICE CARD

HOT PROSPECT

Toshiba's T1000 Laptop Has Its Operating System Contained in ROM

The latest addition to **Toshiba America's** laptop family is the $1,199 T1000, which weighs only 6.4 pounds and measures 12.2 by 2.05 by 11 inches. Toshiba claims it is the smallest, lightest PC compatible available in the United States. The T1000 has an 80C88 processor running at 4.77 MHz and runs for up to 5 hours on a rechargeable nickel cadmium battery, Toshiba says.

The system comes standard with 512K bytes of RAM and can be upgraded with a $549 768K memory card for an additional 128K RAM and 640K of Lotus/Intel/Microsoft expanded memory.

The system comes with a single 720K, 3½-inch floppy disk drive and is optimized for use with the single drive. DOS 2.11 is contained in ROM, and booting from ROM leaves the disk drive free for applications software.

The T1000 has an 80- by 25-line supertwist liquid crystal display, with 640- by 20-pixel resolution and CGA compatibility. The screen angle is adjustable over a 180-degree range.

The $1,199 Toshiba T1000 weighs in at a mere 6.4 pounds. DOS 2.11 is in the laptop's firmware, allowing efficient use of its single floppy disk drive.

Six ports are standard on the T1000, including serial and parallel, RGB color video, composite video, and external 5¼-inch floppy disk and external numeric keypad ports.

A clock/calendar is included, and there is space for Toshiba's optional Hayes-compatible modem inside the T1000's case.

Because it has an 8-bit bus, the T1000 is exempt from tariffs on 16-bit Japanese-made computers. The threat of direct congressional action against Toshiba remains, however.

List Price: Toshiba T1000, $1,199; 768K memory card, $549; Hayes-compatible modem, $399; Automobile power adapter, $59. Toshiba America Inc., Information Systems Div., 9740 Irvine Blvd., Irvine, CA 92718; (714) 380-3000.

CIRCLE 422 ON READER SERVICE CARD

PC UPDATE

edited by Peggy Gavan

Novell E-Net Ethernet

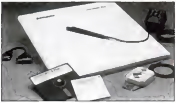
Novell has slashed prices on many of its networking hardware products. The price cuts range from $400 on a low-end server to $6,000 on a fully configured server system. Included is a $100 reduction on the **E-Net Ethernet** adapter board, now priced at $395. Novell Inc., Provo, Utah; (801) 379-5900.

Flash-Up, Flash-Up Developer's ToolBox

The Software Bottling Co. has replaced ***Flash-Up Windows*** with ***Flash-Up*** and ***Flash-Up Developer's ToolBox***. *Flash-Up*, priced at $89, allows any user to create keyboard macros, design custom menus, and attach electronic notes to documents without programming. *Flash-Up Developer's ToolBox* is an add-on product with a programming language interface and runtime module priced at $49. Registered users can purchase both products for $49 by returning their upgrade request form. The Software Bottling Co., Maspeth, N.Y.; (718) 458-3700.

SummaSketch Plus, Windows

Summagraphics has upgraded its **SummaSketch** digitizing tablet to **SummaSketch Plus**. The new version, priced at $649, features a software driver that enables users to draw graphics through *Microsoft Windows* and offers 1,000-line-per-inch resolution. Registered owners of the original SummaSketch (still available for $599) can purchase an upgrade utilities disk for $39.95. Summagraphics, Fairfield, Conn.; (203) 384-1344.



SummaSketch Plus, an enhanced SummaSketch digitizing tablet, allows users to draw graphics through Windows.

LANLink 5.0

LANLink, Version 5.0, supports PC-MOS/386 and PC/MS-DOS 3.3 in any combination on both servers and workstations. The *LANLink* starter kit is priced at $495; upgrades range from $25 to $50. The Software Link, Atlanta, Ga.; (404) 448-5465.

NEC Building Laptops in the United States

NEC's MultiSpeed laptops are no longer affected by the current 100 percent tariff on Japanese 16-bit laptops (see First Looks, page 34, *PC Magazine*, Volume 6 Number 12). On June 30, MultiSpeeds started rolling off production lines at an NEC plant in Georgia; the company plans to start manufacturing the MultiSpeed EL there in the near future.—**Gus Venditto**

PicturePower

PicturePower, Version 1.6, has several enhancements, including screen display in color or gray scale and additional support for capture/display boards and printers. In addition, users can now capture pictures directly into a database record and edit pictures stored in both individual picture files and database records. Registered users can upgrade to this latest version, priced at $945, free of charge. PictureWare, Bala Cynwyd, Pa.; (215) 667-0880.

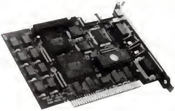
IN BRIEF

Tracer: The Spreadsheet Detective, Version 3.04, is now available for use with *HAL*, *Symphony*, *The Twin*, and *VP-Planner*. *Tracer* is priced at $89.95. The Mt. Whitney Group, Garden Grove, Calif.; (714) 891-6320 . . . ***CPA Plus***, now available in a *VP-Planner* version, has a new price of $199, down from $295. FrontRunner Development Corp., Van Nuys, Calif.; (818) 376-1322 . . . ***T-Debug-PLUS***, Version 2.0, has several new features, including watch variables, conditional breakpoints, graphics support, and LAN support. Registered users can upgrade to the $60 program for $20. Turbo Power, Scotts Valley, Calif.; (408) 438-8608.

PS/2 WATCH

QuadEGA ProSync, VGA

Quadram has introduced a BIOS-level **VGA** upgrade kit for its **QuadEGA ProSync** graphics board customers. The kit, priced at $10, includes a BIOS upgrade, installation instructions, and software drivers for *WordPerfect*, *WordStar*, *AutoCAD*, *GEM*, and *1-2-3*. Also included is an Enhancement Selection Utility that enables users to select the desired display mode for these programs. The kit is available directly from Quadram at (404) 564-5567.



Quadram is offering a $10 VGA upgrade kit for customers of its QuadEGA ProSync graphics board.

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>
> *Michael Abrash, Programmer's Journal*

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Technical Specifications

- ☑ *Compiler: One-pass optimizing compiler generating linkable object modules. Included is Borland's high-performance Turbo Linker.™ The object module is compatible with the PC-DOS linker. Supports tiny, small, compact, medium, large, and huge memory model libraries. Can mix models with near and far pointers. Includes floating point emulator (utilizes 8087/80287 if installed).*
- ☑ *Interactive Editor: The system includes a powerful, interactive full-screen text editor. If the compiler detects an error, the editor automatically positions the cursor appropriately in the source code.*
- ☑ *Development Environment: A powerful "Make" is included so that managing Turbo C program development is highly efficient. Also includes pull-down menus and windows.*
- ☑ *Links with relocatable object modules created using Borland's Turbo Prolog® into a single program.*
- ☑ *Inline assembly code.*
- ☑ *Loop optimizations.*
- ☑ *Register variables.*
- ☑ *ANSI C compatible.*
- ☑ *Start-up routine source code included.*
- ☑ *Both command line and integrated environment versions included.*
- ☑ *License to the source code for Run-time Library available.*

Sieve benchmark

	Turbo C	Microsoft® C
Compile time	*2.4*	13.51
Compile and link time	*4.1*	18.13
Execution time	*3.95*	5.93
Object code size	*239*	249
Execution size	*5748*	7136
Price	*$99.95*	$450.00

*Benchmark run on an IBM PS/2 Model 60 using Turbo C version 1.0 and the Turbo Linker version 1.0; Microsoft C version 4.0 and the MS overlay linker version 3.51.

Minimum system requirements: IBM PC, XT, AT, PS/2 and true compatibles. PC-DOS (MS DOS) 2.0 or later. 384K

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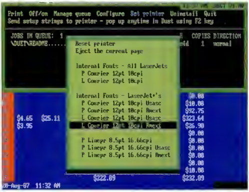
BI-1136

CIRCLE 137 ON READER SERVICE CARD

Duet Prints Sideways in the Background

PC HANDS ON

BY EDWARD MENDELSON



```
Print  Off/on  Manage queue  Configure  Set printer  Uninstall  Quit
Send setup strings to printer - pop up anytime in Duet using F2 key

 JOBS IN QUEUE:  1                                    E   COPIES DIRECTION
 \DUET\README......  Reset printer                    id     1    normal
                     Eject the current page

                     Internal Fonts - All LaserJets
                       P Courier 12pt 10cpi
                       L Courier 12pt 10cpi

                     Internal Fonts - LaserJet+'s             $0.00
                       P Courier 12pt 10cpi Usasc             $10.00
                       P Courier 12pt 10cpi Rmext             $92.75
  $4.65   $25.11       L Courier 12pt 10cpi Usasc            $323.64
  $3.95                L Courier 12pt 10cpi Rmext             $26.90
                                                              $0.00
                       P Linepr 8.5pt 16.66cpi                $0.00
                       P Linepr 8.5pt 16.66cpi Usasc          $0.00
                       P Linepr 8.5pt 16.66cpi Rmext          $0.00
                                                              $0.00
                                                             $10.00
                            $222.09                         $232.09
20-Aug-87  11:32 AM
```

Duet *can configure a printer and manage a print queue from within an applications program; it offers a good choice of laser printer options*

Duet, from Consumers Software, is a print spooler with a difference. This program starts with the features of an intelligent memory-resident spooler, including background printing and full control over the sequence and timing of print jobs. It adds pop-up menus that control any printer function from inside an application. And it knows all there is to know about printing spreadsheets.

Working entirely in the background, *Duet* can print all or part of a Lotus-style .WKS format spreadsheet, sideways or upright, with optional headers and footers—and you don't have to load the file into *1-2-3*. The program can even find a named range in the file and print it separately. For sideways printing *Duet* uses the resident fonts in a laser printer and any of 12 of the program's own fonts with a dot matrix printer.

You don't have to like spreadsheets to love *Duet*. The disk includes three smaller versions of the program that omit the spreadsheet-specific functions. With all versions, *Duet*'s pop-up printer control menu lets you change fonts, margins, and other functions on the fly. The Laserjet menu includes over 50 commands, and smaller menus control 36 other printers. You can modify a sample file to create a menu for any printer not supported.

Except when printing spreadsheets, Laserjet users probably won't see an increase in efficiency by using a spooler. But with an impact printer, *Duet* will let you get back to work faster after you start printing.

List Price: *Duet*, $89.95.
Requires: 256K RAM, DOS 2.0 or later. Not copy protected.
Consumers Software Inc., 736 Chestnut St., Santa Cruz, CA 95060; (408) 426-7311.

CIRCLE **437** ON READER SERVICE CARD

SayWhat?! Does Designer Screens

PC HANDS ON

BY CATHERINE MILLER

Counting characters and code to create screens can be one of the most tedious things a programmer does. *SayWhat?!*, from The Research Group, is a fast and fun way to generate screens in any programming language.

You create screens using the *SayWhat?!* editor. The foreground and background video attributes, as well as the symbol set used to draw lines and boxes, are controlled using the function keys.

The command keys, A–Z, allow you to customize your screens quite easily. You can even create both horizontal and vertical moving-bar menus.

The memory-resident Vidpop utility makes use of the video interrupt (10h) to call the screens you create from your program. This requires one extra line of code in your program. Vidpop instructions for programming languages that ignore interrupt 10h, such as Turbo BASIC, are included.

SayWhat?! is intuitive, well-designed, and a pleasure to use. And you'll be pleased with the screens you create with it.

List Price: *SayWhat?!*, Version 3.6, $49.95. **Requires:** 192K RAM, graphics adapter, DOS 2.0 or later. Not copy protected. The Research Group, 88 S. Linden Ave., South San Francisco, CA 94080; (800) 468-9273, (800) 231-7849 in Calif.

CIRCLE **438** ON READER SERVICE CARD

C/T Keyboard: Close to IBM's Feel

PC HANDS ON

BY JONATHAN MATZKIN

Since IBM compatibles first appeared, users have put up with keyboards that feel like wet oatmeal. Northgate Computer Systems' $99 C/T keyboard (for XTs and ATs) improves on the mushy clone standard, but brings in a few minor problems of its own.

The 101-key version I tested (there is also an 84-key unit for $79) differs slightly from IBM's 101-key Enhanced layout.

For openers, the unlabeled Break function is on the ScrollLock key, not the Pause key.

Next to the ScrollLock key is the Pause key, which is also marked "Reset." Sure enough, Ctrl-Reset triggers a warm boot. That's a nice feature, but placing the Break and Reset keys side by side is definitely tempting fate.

There are some welcome touches: Northgate's L-shaped Enter key is much larger than IBM's and easier to find with a pinkie. The CapsLock key is also bigger.

Northgate's excellent tactile response approximates the "clicky" feel that IBM keyboards are known for. The resistance isn't quite as stiff as on the old IBMs, but typing on the C/T is smoother and more comfortable than on any of the replacement or clone keyboards I've tried.

Despite its layout quirks, the Northgate C/T is well worth considering for the tactile response alone.

List Price: C/T 101-key keyboard, $99. Northgate Computer Systems, 2905 Northwest Blvd., #250, Plymouth, MN 55441; (800) 328-8907.

CIRCLE **436** ON READER SERVICE CARD

How Eureka: The Solver instantly solves equations that used to keep you up all night

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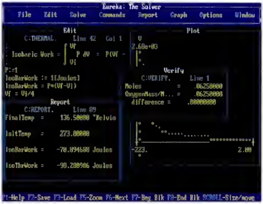
Eureka: The Solver
File Edit Solve Commands Report Graph Options Window
Edit
Plot
Verify
Report
F1-Help F2-Save F3-Load F5-Zoom F6-Next F7-Beg Blk F8-End Blk SCROLL-Size/move

```
C:THERMAL.    Line 42   Col 1
                     ⌠ Vf
  Isobaric Work =    │    P dV  =  P(Vf -
                     ⌡ Vi
P:=1
IsoBarWork := 1[Joules]
IsoBarWork = P*(Vf-V))
Vf = Vi/4
```

```
C:VERIFY.        Line 1
Moles              =    .06250000
OxygenMass/M... =       .06250000
difference =           .00000000
```

```
C:REPORT.      Line 89
FinalTemp  =     136.50000 °Kelvin

InitTemp   =     273.00000

IsoBarWork =    -70.894688 Joules

IsoThrWork =    -98.288906 Joules
```

Eureka instantly solved this Physics equation by immediately calculating how much work is required to compress isobarically 2 grams of Oxygen initially at STP to ½ its original volume. In Science, Engineering, Finance and any application involving equations, Eureka gives you the right answer, right now!

Eureka can solve most equations that you're likely to meet. So you can take a mathematical sabbatical.

Most problems that can be expressed as linear or non-linear equations can be solved with Eureka. Eureka also handles maximization and minimization, plots functions, generates reports, and saves you an enormous amount of time.

Eureka instantly solves equations that would've made the ancient Greek mathematicians tear their hair out by the square roots—and it's all yours for only $167.00.

It's easy to use Eureka: The Solver

1. Enter your equation into the full-screen editor
2. Select the "Solve" command
3. Look at the answer
4. You're done

You can then tell Eureka to

- Evaluate your solution
- Plot a graph
- Generate a report, then send the output to your printer, disk file or screen
- Or all of the above

Minimum system requirements: For the IBM PS/2™ and the IBM® and Compaq® families of personal computers and all 100% compatibles. PC-DOS (MS-DOS®) 2.0 and later. 384K.

Eureka: The Solver is a trademark of Borland International, Inc.
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You can key in:

- ☑ A formula or formulas
- ☑ A series of equations—and solve for all variables
- ☑ Constraints (like X has to be < or = 2)
- ☑ A function to plot
- ☑ Unit conversions
- ☑ Maximization and minimization problems
- ☑ Interest Rate/Present Value calculations
- ☑ Variables we call "What happens?," like "What happens if I change this variable to 21 and that variable to 27?"

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>
> *Stephen Randy Davis, PC Magazine*”

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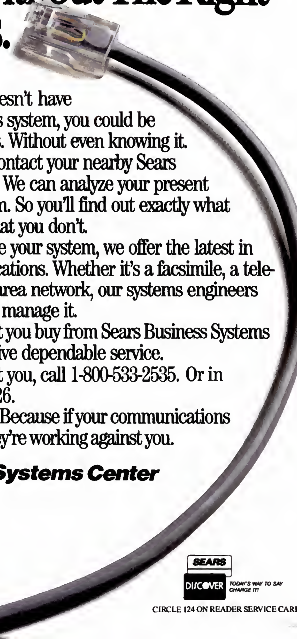

COMMUNIQUÉS

edited by Bill Howard

Classified Intelligence

CT's Premier Lending Institute is seeking a top notch word processing operator. The ideal candidate should have at least 2 years experience . . . preferably Display Wright ¾ . . . .

—New Haven *(Ct.)* Advocate, *July 27, 1987*

MICRO-FISH Clerk, $5.70 an hour, experience microfish & duplicating film. Excellent benefits. Call American Personnel, xxx-xxxx.

—Beaumont *(Tex.)* Enterprise, *July 30, 1987*

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—Bismarck *(N.D.)* Tribune, *August 2, 1987*

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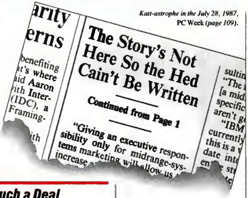
—The Herald *(Everett, Wash.), July 12, 1987*

Who's to Argue?

Computer Quest bills itself as "Houston's Only Authorized Clone Dealer."



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The Story's Not Here So the Hed Cain't Be Written

Continued from Page 1

"Giving an executive responsibility only for midrange-systems marketing will allow us increase

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Katt-astrophe in the July 28, 1987, PC Week *(page 109).*

Such a Deal

"$1199 20 Mgb [Rodime] SCSI Mac Hard Disk plus your choice free from: Omnis 3, Excel, Word 3.0, Ready, Set, Go 3 ($395 value). Drive alone, $899."

—*Computers Etc. ad,* The Boston Globe, *July 22, 1987*

Memory Cash

"You'll find important information on the Z800000's address spaces . . . money management . . . operand addressing modes."

—*Electronics and Control Engineers Book Club, July 1987, ad for* 32-Bit Microprocessors, *by H. J. Mitchell*

It Corrects All Misspellings?

"CORRECT—fixes all the misspellings found by the SPELL command."

—XyWrite III Plus *on-line help*

Amazing Facts I

"[Dot matrix] printers can be used for both graphics and text, with speeds and the number of wires varying the degree of print quality. For example, a 9-pin printer, as its name implies, shoots ink through nine pins on its print head."

—PC Week, *August 11, 1987*

Amazing Fax II

"A machine invented in 1842—ancient by computer communications standards—is more popular today than ever. It invaded the microcomputer world just last year, and this year it is coming to LANs. Facsimile or 'fax' machines, which transmit images over phone lines . . . ."

—LAN Times, *July 1987*

"Are you accessible on a 2,400-bps dial-up line?"

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Winners this issue: Bill Steele (PC Week headline), Matthew Farley (Blue Chip), Karen M. Reardon (Display Wright ¾), Paul W. Helegda (micro-fish clerk), Don Bachmeier (oval drives), Jim Hicks (Compact desk probe), Shannon Brunjes (shoots ink), Matt McCarty (1842 fax), Nick Hart (XyWrite fix), Jerry Dallal (Mac hard disk), Eleanor Reim (clone dealer).

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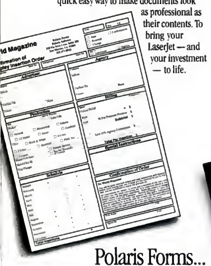

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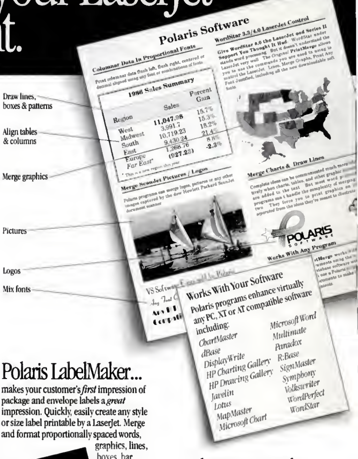

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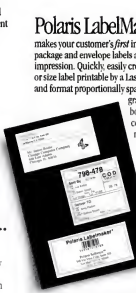

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■ **FROM THE EDITOR'S SCREEN** ■ BILL MACHRONE

WHAT'S WRONG WITH LASERS

Everyone had decided that laser printers were practically perfect in every way. Now users are discovering they have serious shortcomings.

Laser prices have plummeted. But are they cheap enough to give one to everybody? Not yet. And even if they were, would they do the job you need to get done? Nope.

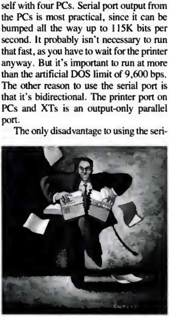
In letter-quality applications, laser printers really fall down on forms handling. The inexpensive ones have only one feed tray, and the fancy ones either cost too much or have the wrong feature mix. Too many companies have wasted money talking to laser printers through LANs, only to discover that they still had a productivity bottleneck.

Here are my specifications for the perfect printer.

For business correspondence, a laser printer needs three feeds: envelope, first sheet, and second sheet/plain bond. The plain bond input tray should be the biggest, 200 sheets minimum. All input bins found on today's printers have paper-out sensors. Why in heaven's name don't they have an output-tray-full sensor? And the few laser printers that can actually feed envelopes either can't send them to the main output tray or can't collate them with first and second sheets.

MEMORY IS CHEAP The prices printer manufacturers charge for add-in memory are criminal. It's equally criminal to sell a printer with only 512K. A megabyte is a practical minimum. More can only help. You need it for font storage, downloaded logos and special symbols, graphics, and buffering multiple tasks. Heck, for what some manufacturers are charging for upgrades, they could put an entire hard disk subsystem into the printer. Sure, there'll come a day when laser printers will have internal CD-ROMs with every typeface known to mankind, but right now we need much cheaper memory and a whole lot more of it.

Conventional wisdom today says that it's too expensive to network your printer. I agree. But I think the laser printer should be shared and that it should do the sharing. The printer should be capable of sharing itself with four PCs. Serial port output from the PCs is most practical, since it can be bumped all the way up to 115K bits per second. It probably isn't necessary to run that fast, as you have to wait for the printer anyway. But it's important to run at more than the artificial DOS limit of 9,600 bps. The other reason to use the serial port is that it's bidirectional. The printer port on PCs and XTs is an output-only parallel port.



The only disadvantage to using the serial port is that not every machine has one. PCs may not have any serial ports; XTs and ATs may have their serial port occupied by a modem. But I'll bet there are a lot of SixPaks out there with unused serial ports.

Bidirectional communication with the printer is important. Today's machines do a lousy job of telling you what's going on. My dream printer would have a full-fledged communications controller to poll the PCs in round-robin fashion. It grants access on a first-come, first-served basis. In addition to locking out the other machines, it should send back codes that signify the printer is busy or various error conditions.

THE SOFTWARE KEY The PC has the brains, the memory, and the disk. It should do the print spooling and command interpretation in a small resident program that runs on each PC.

Its first job is to interpret document feeder commands and to provide simple logic so that the user doesn't have to put long escape sequences into his word processor. The program should have an install menu that tailors it to specific word processors or maybe even installs the correct driver codes in the word processor.

If the printer is available, the program sends the file, interpolating bin codes as necessary and monitoring the printer for error conditions. All errors would be interpreted and explained to the user in pop-up text messages. It would broadcast things like receiver-tray-full conditions to all stations.

Illustration: Dave Cutler

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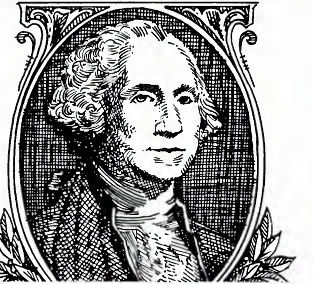

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CIRCLE 524 ON READER SERVICE CARD

If the printer is not available, the program spools the output to memory or disk and waits for an all-clear signal from the printer. The printer, despite its preoccupation with the job it's currently printing, should send back a priority code so that the delayed machine knows where it is positioned in the queue. The PC can then tell the user that it's trying to get the job printed and where it stands.

The resident program should have pop-up windows on each PC to unconditionally select any bin. At the same time, the program could download and select fonts, as well as set the number of copies and portrait or landscape mode.

ENVELOPE MANAGEMENT Envelope/address handling also needs to be done in the software. It should automatically rotate and drop the envelope and indent the address. The amount of indentation and drop should be definable by the user, but set-and-forget.

Finally, a communications program in the printer could be cognizant of all the PCs sharing the printer. It would be relatively easy to have a little pop-up message window in which the operators could exchange or broadcast messages. (I reloaded it last time. YOU reload it!) It's a far cry from a LAN, but this feature could come in handy and be a unique selling/productivity point.

My perfect printer also needs an override mode that unconditionally grants access to one user. This is probably desirable for desktop publishing programs, in which long periods of inaction might be misinterpreted as printer availability. You wouldn't want anyone else to come in and mess up your downloaded fonts or lengthy graphics prints. The resident program in each PC would inform users of the printer's nonavailability. For that matter, a printer with enough memory could work cooperatively with the PC's print spooler/manager, reserving some memory for each user.

The irksome thing about all this is that the technology is on the shelf, waiting to be integrated. Cheapo hard disks, RS-232 LANs, and smart controllers are readily available.

Who'll be the first to do it? I'll be the first to buy it.

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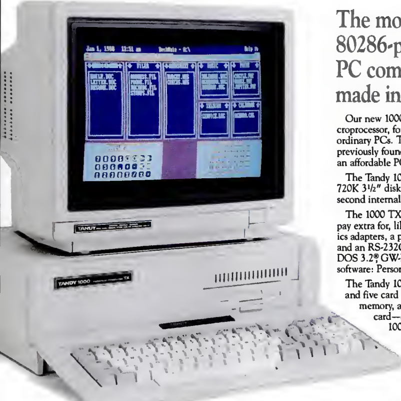
The New Tandy® 1000 TX



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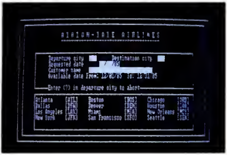
CIRCLE 289 ON READER SERVICE CARD

THIS IS ONE OF dBase's SAMPLE PROGRAMS.



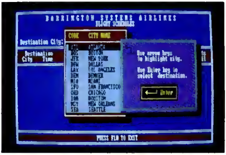
```
[illegible] AIRLINES

Departure city        Destination city
Requested date     / /85
Customer name
Available date From: 12/01/85  To: 12/31/85

Enter (?) in departure city to abort

Atlanta     [ATL]  Boston        [BOS]  Chicago     [ORD]
Dallas      [DFW]  Denver        [DEN]  Houston     [IAH]
Los Angeles [LAX]  Miami         [MIA]  New Orleans [MSY]
New York    [JFK]  San Francisco [SFO]  Seattle     [SEA]
```

THIS IS THE SAME PROGRAM, BUT CLARIONIZED™.



```
BARRINGTON SYSTEMS AIRLINES
FLIGHT SCHEDULE

Destination City:
 Destination
City    Time

CODE  CITY NAME
ATL   ATLANTA
BOS   BOSTON
JFK   NEW YORK
DFW   DALLAS
LAX   LOS ANGELES
DEN   DENVER
MIA   MIAMI
SFO   SAN FRANCISCO
ORD   CHICAGO
IAH   HOUSTON
MSY   NEW ORLEANS
SEA   SEATTLE

Use arrow keys
to highlight city.

Use Enter key to
select destination.

PRESS F10 TO EXIT
```

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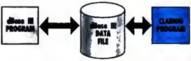

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CIRCLE 152 ON READER SERVICE CARD

■ **JOHN C. DVORAK**

SEVEN LESSONS IBM LEARNED FROM THE PCJR

The PCjr II, alias the PS/2 Model 25, demonstrates that you can teach an old dog new tricks: IBM learned a lot from the Junior disaster and Model 25 owners will benefit.

Cynics looked at the rollout of the PS/2 Model 25 and immediately called it another PC*jr*—an obvious dud. These were the same guys who predicted that the PC*jr* would be a runaway success. Now they're wrong again. The Model 25 is a superb machine. I think it may be the PC*jr* II or possibly what the PC*jr* should have been way back when. It's hot. It's cute.

I call it the PC*jr* II because if you made a list of all the complaints provoked by the PC*jr*, you'd quickly discover that this machine corrects them all. Let's compare the Model 25 to the PC*jr* and see what lessons the company learned.

(1) Use a good keyboard. The PC*jr* was released with a cheap, Chiclet-style keyboard. The company had to give away a new keyboard after people moaned for nearly a year. The designer of the Chiclet keyboard talked about how great it was because you could put it in a dishwasher to clean it. Obviously the company hoped 4-year-olds and slobs used the machine. Some market. The Model 25 has an excellent and normal IBM-type keyboard.

(2) Make the machine rugged. The PC*jr* was a flimsy machine. The top had to be pried off to get to the slot. The Model 25 is solid and sturdy.

(3) Be realistic. The PC*jr* was designed for schools yet used an infrared keyboard. This must have been a laugh riot in a school with Tommy aiming his keyboard transmitter at Linda's machine and typing some comment to her. You had to buy a special adapter to hook the keyboard directly to the machine. The Model 25 has no such screwball keyboard and also accepts a mouse for input.

(4) Keep things standard. The PC*jr* had a lot of weird rectangular connectors for all the ports, video display, direct keyboard connection, and so on. The Model 25 uses normal connectors.

(5) Keep things compatible. The PC*jr* had peculiar slots. One accepted only a modem. One was an expansion connector on the side of the machine. To add a serial port or extra memory, you added a side-mounted module. After a couple of these clunkers the machine got so wide it looked like an aircraft carrier. The Model 25 has two plain-vanilla PC slots for expansion.

(6) Keep things simple. The PC*jr* came with 128K bytes of memory and its ports (all with weird connectors) were RGB out, TV RF out, video out, joystick, joystick #2, line printer, extra disk drive out, audio out, cassette out. Each required a special connector, and many needed an adapter of some sort. The Model 25 has a monitor built-in, so there is no need for any video ports. It has room internally for a second drive, so there is no need for a disk drive port. It has a keyboard port, a mouse port, and a standard serial and parallel port.

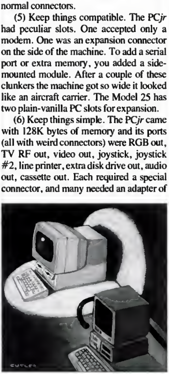


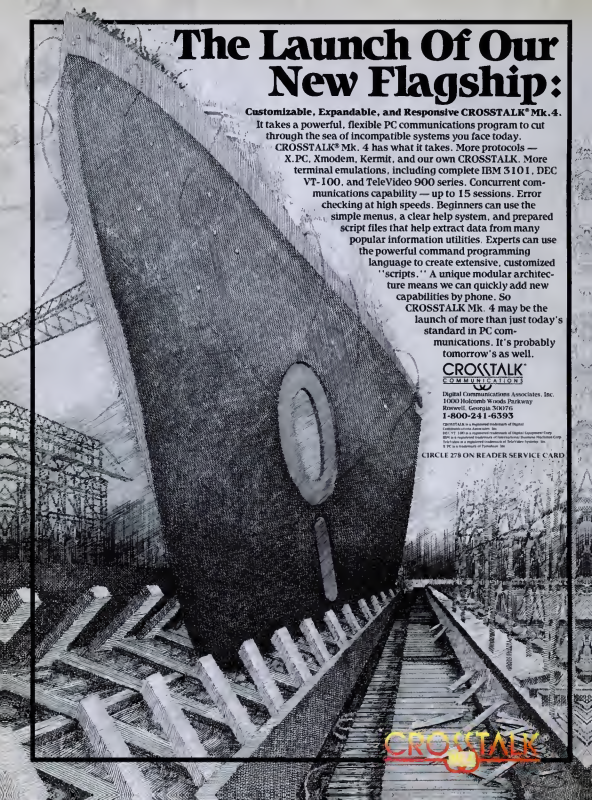
Illustration: Dave Cutler

(7) Keep things neat and functional. The PC*jr* was a maze of wires. The power supply was outside the computer on the power cord. All accessories had to be separately powered. The Model 25 is the epitome of simplicity. Its internal 90- to 125-watt power supply should handle most loads. Its design allows it to be bolted down, too. Perfect for theft-prone schools.

AFTER PAIN, MUCH GAIN These are the seven major lessons IBM learned. I suppose you could find 25 lessons if you wanted to match the model number. The fact is that the PC*jr* was a clunker and the Model 25 is a nice little computer. The MCGA card produces excellent output, although the VGA would be better. The color monitor still seems IBM fuzzy, but IBM should correct that if humiliated enough. The Model 25 runs twice as fast as an XT and it's more than adequate as a desktop machine for most people.

Even compare this thing to the original IBM PC of 6 years ago. You get twice the processor speed, four times the disk capacity per drive, faster memory, free parallel and serial ports, free video display, all-in-one design, and all for one-third the price. The Model 25 will be more successful than a lot of people want to believe.

Perhaps a better essay would ask IBM what took it so long to do this machine.



■ **JOHN C. DVORAK**

INSIDE TRACK

Comdex Preview: 386 introductions to intensify; cheap laser glut to grow; 600-dpi lasers ready for prime time.

It's time to start thinking about **Winter Comdex.** This year the gala event happens in the first week of November, and as usual the hot products are predictable. Expect to see a **slew of 80386 machines,** too many **cheap laser printers** for the market to digest, and new laser printers offering 600-dot-per-inch resolution. That should be about it.

In the software arena I don't expect much new, although rumors of a ***dBASE IV*** permeate the scene. Every time I tell people these rumors, they always say, "Good. Ashton-Tate needs to update that thing." Finally after years of dominance on the scene, the *dBASE* family of database products is starting to get that ***WordStar*** **odor**, making it prone to taking a future backseat to a *WordPerfect* of databases. When Ashton-Tate founder George Tate was still alive, he had his heart set on making the **Framework** database system the next standard. *dBASE* was a goner in his mind way back when.

"Dvorak," Tate once told me, "You knew me when I discovered *dBASE II*. Let me tell you that *Framework* is the single greatest piece of software I've ever seen." Maybe so, but it would have taken the same energy he put into making *dBASE II* the standard to popularize it, and once he died the energy was gone. *Framework* lingers as a Flying Dutchman of an integrated program. Worse, **Ashton-Tate's sluggishness** in implementing a slick mouse interface for *Framework* sealed its fate as a **second-tier** product. As anyone who has ever used *Framework* knows, the product begs to be sold and used with a mouse.

So here comes *dBASE IV* hoping to go head-to-head in the features race with ***R:base System V, Paradox***, and other pretenders to the crown. We haven't seen the next king yet. I don't think it's been released. If *dBASE IV* is a lot better than *dBASE III*, then Ashton-Tate may hang in there for a few more years as king of the database hill. But the "if" looms large. Whatever the case, **expect much hoopla** over *dBASE IV*.

Meanwhile, **IBM is on a rampage** and I'd expect a big announcement from it around Comdex time. One insider told me to expect a lot of products from IBM this year and next. This means all the rumors about the missing numbers in the Personal System/2 schema are correct. So expect Model 10, Model 15, Model 20, Model 90, and so on. I'd be curious to see the **Model 5.** Perhaps it's that free solar calculator that IBM offered as a giveaway last year if you went into a ComputerLand to check out their stuff. I took my invitation and went to ComputerLand and figured I'd get a collectible IBM solar calculator. "Gee, that's the first we heard of it," said the salesclerk. "Yeah, I heard something about it," said another. I never got my calculator. Some promotion. **I'm sure this fiasco sold a lot of computers for IBM.**

IBM's recent West Coast announcement for the Model 25 wasn't much to brag about either. I've been to a dozen press conferences at the French-owned San Francisco Meridian, site of the announcement, and **this was the worst in terms of pizzazz.** Worse, there were no rolls or melon balls. It's not that I can't afford such things, but the Meridian is known for its food and when anybody does anything there you get a fabulous taste of France as an incentive to come. All IBM had was a pot of coffee. It cheapened the feeling the reporters had toward the Model 25, which I think is a great little computer. The **chintzy** atmosphere, though, immediately **brought to mind the PC*jr*** and that's all the local press harped on. Talk about penny-wise and pound-foolish.

Tandy, the day before in New York, had problems of its own. By squeezing deadline time, it decided to roll out its Tandy 4000 by inviting the bleary-eyed media to an event in New York City at 9AM, presumably to beat some East Coast daily news deadlines. (These deadlines can be as easily handled by having private meetings the night before, by the way.) So that the West Coast wouldn't be left out, Tandy told its dealers to tune in for a "live" TV feed of the press conference. They expected the West Coast people to **get up at 5 in the morning** to make a 6AM Pacific Time presentation.

I know that Tandy is in Texas (home of the Texas Aggies), **where farmers *have* to get up at 5** to make sure the farm hasn't been destroyed by a twister the night before. But why make Californians suffer? If I were one of the managers out on the coast, I'd say, "Tape it! Go back to bed." It's better to be alert in the afternoon when paying customers want to talk. That's unless they now **milk cows at Radio Shack**. Maybe they do.

I suppose PR horror stories are a dime a dozen, but it always surprises me when big companies do dumb things. The biggest PR joke happened to me recently. I was contacted by a company with the unlikely name of **Yogo Yogo**, the exclusive agents for the Hyundai Blue Chip computer. Did I want to review it, asked the lady. Not really, but I will, I said. **A week later I got a $1,000 invoice for the machine.** I didn't want to buy one! What gives, I wondered. Two days after that I got a UPS delivery of a Blue Chip machine, freight collect! Am I now financing Hyundai? I refused the shipment. I complained. Two days later the machine came back, again freight collect. It's **no coincidence** that Blue Chip isn't setting the world on fire.

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CIRCLE 275 ON READER SERVICE CARD

■ JIM SEYMOUR

WHY DO COMPUTER PEOPLE ALWAYS TALK SO FUNNY?

Is it the computers that are difficult to understand, or is it just the strange, and often meaningless, terms created by the people who talk about them?

The other day I was talking long-distance with a British software developer. His new wonder had reached my desk a few days earlier. When I found that almost none of the features of the program worked properly, I called his American distributor, who telexed my comments across the Atlantic.

Just what was it, he boomed through the phone, that I didn't like about his program?

Well, it wasn't that I didn't *like* the program—in fact, I needed its features myself, knew a lot of other people who did, too, and was predisposed to like the thing. But, I said, when I tried to use its biggest feature, the program just . . . .

"I know, I know," he said abruptly, irritated. "What else?"

Well, I said, when I tried the second big thing it was supposed to do, which was also a great idea and much needed, it produced illegible printouts, with letters printed on top of one another.

"I know, I know," he interjected. "What else?"

Well, the third thing mentioned on the back of the package was clever, too, but when I tried to . . . .

"I know about that," he said. "Anything else?"

Well . . . . You get the idea. I eventually pointed out that almost every one of the features which were touted on the back of the package didn't work in some fundamental way.

"I know, I know," I heard again. "It's the same with all you Americans."

Come again?

"You all want excessive functionality."

I wish I could roll that wonderful phrase out with the gusto with which he spat it at me across the pond. It was impressive.

Think about that for a minute: excessive functionality. Lovely. In this case, meaning "expecting a program to do what its vendor says it will do."

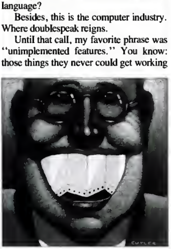
Excuse me, but if that's excessive—if we shouldn't want or need a program to do those things it advertises it can do—then why should we buy the package?

Click. Mmmmmmmmmmmmmmmmm.

But I wasn't offended. How can you be angry with anyone who broadens your vocabulary with such a rich extension of the language?

Besides, this is the computer industry. Where doublespeak reigns.

Until that call, my favorite phrase was "unimplemented features." You know: those things they never could get working right in beta-level software but were too much trouble to take off the menu. So you sat there at night, pounding away at the keyboard and ripping apart the manual, trying to get the software to do something it was never destined to do.



LOOSE LANGUAGE There's something about the computer business, I fear, that leads to a loss, or at least a perversion, of the language. It's not just *business,* which, Lord knows, has contributed generously to the verbifying of America ("I office on 47th Street. Where do you office?"). It's something more, something worse, this technobabble we find ourselves muttering.

A fellow who is a VP at a big software company, which must remain unnamed, has a healthy funny bone and a good ear for mangled language. I first met him this spring, when he zinged me for using the phrase "The PS/2s are a satisfying ratchet-up in technology . . ." in these pages. I'm sure he (and you) knew what I meant, but that wasn't exactly an elegantly turned phrase.

He has sent me a few of his favorites among the nonwords and dumb phrases that have popped up in the business so far this year.

My picks from his list:

"The portation of our software to UNIX might take a few months."

"The documentation is technical and must be use-ified before we release the product."

"We'll have to do some analyzation first."

Illustration: Dave Cutler

"It will be the next release before these ideas reach fruitation."

"On new orders, we need a shippee address in addition to a shipper address."

But you understand what they *meant*, don't you? Does that worry you? Just a little? Keep reading:

"The proposed organization implies more project teams reporting in a matrixly fashion."

"Some tables should be clusterized around their owners in the database."

"I wouldn't want to buy hardware or software which might erode the DEC-ness of my shop."

"These sales figures have an anomalty in them."

"We'll have to ballpark these time estimates."

"*Xxxx* was good, but it was batchish in its interface."

"We are discomfortable with that long-term strategy."

> ■ There's something about the computer business, I fear, that leads to a loss, or at least a perversion, of the language.

Getting a little discomfortable yourself? Do these sound like things that appear in the stuff that crosses your desk every day? More:

"Let's try to incent these salespeople."

"IBM reports a constrainment on certain of the new PS/2s."

"We'll soon productize the AI prototype."

"Release *X* has to be C-trakized for the government market."

"And then once you've detected an error, memory should be snapshotted immediately."

Enough, enough. I think I've snapshotted the problem enough for us to use-ify it adequately so we can incent ourselves not to fruitate our ideas like that.

But if that's nervous laughter I'm hearing—and if there's even more of it when you Xerox this and pass it around (c'mon, we know you do that)—then maybe you, too, need to ballpark some of the anomalties in your shop for analyzation and ratcheting-up.

Lest you start sounding like a "computer person." PC

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During its strategic planning process, Eaton Corporation sends Lotus spreadsheet files to 100 managers across the country. Thanks to Lotus Express, "there's a closer coordination with managers, which results in better decision making," says Robert Martin, manager of executive support systems at Eaton Corporation.

Before Lotus Express, Eaton would make 100 copies of the data diskette, ship them overnight– and any time a revision was made, they'd have to repeat the process. Martin eventually tried a modem-to-modem communication program, but couldn't afford to invest the personnel or time in difficult, repetitive routines.

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Offer expires November 30, 1987 Lotus Express

Lotus Express

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CIRCLE 541 ON READER SERVICE CARD

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CIRCLE 361 ON READER SERVICE CARD

PC/FOCUS
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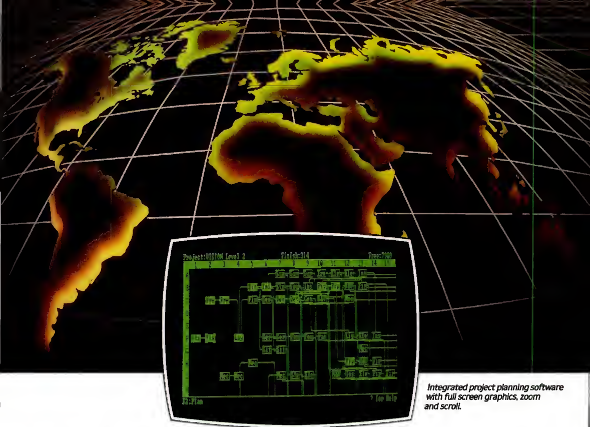

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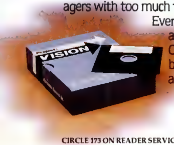

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■ STEPHEN MANES

THE 18-MONTH WAIT

How long will it take till IBM will sell you the machine you really want? From his lofty perch atop the horsey-set, Charlie the Chart says a year and a half.

Despite the national fame of his all-organic luncheonette, Charlie the Chart does not derive his wealth and fame from his much-honored brains or celebrated sweetbreads. In fact, it's his notoriety in the investment circles of Atlantic City, Las Vegas, and Santa Anita that has made him a living legend and earned him his collectible Cadillac and fine rent-controlled studio apartment in one of the developing neighborhoods of the Bronx.

"Ye gods!" he apostrophized recently, looking up from the latest edition of the *Daily Racing Form*. "I am considering a foray into the uncharted waters of the electronic computer."

I raised my forkful of beef heart in salute. "Good luck and Godspeed."

"Those I will definitely need," Charlie replied. "The nub of the matter is that when push becomes shove, I have singular difficulty determining on which figurative horse's nose to place the double sawbuck."

"I understand perfectly, Charles," said I through an impeccably seasoned mouthful of tripe. "You are not alone in your perplexity and dither."

Charlie contemplatively tugged on his tattooed earlobe. "When in doubt I rely on my much-heralded ability to reduce the data to a chart. Hence my sobriquet. I have here such a document."

He slid a crumpled, deckled place mat facedown across the Formica, carefully avoiding two small ponds of liver drippings. The chart's rustic hand-drawn charm recalled the state of the art in business graphics—as of 5 years ago in the lemonade-stand business. "Explain," said I.

Charlie's oleaginous forefinger produced a midmat stain. "Observe," he said professorially. "Each point on the chart represents the introduction of a major IBM Personal Computer product. The abscissa—do you not adore that word?—represents the number of months since what I jovially call 'zero hour'—that is, the introduction of the original IBM PC."

His expansive gesture toppled the vinegar shaker to the floor. "Now behold the regularity of the points along the *x*-axis. Herein lies the crooks."

CHARTING HISTORY In graphical glory the cold facts were arrayed like soldiers prepared to defend a position. "Recall: the original IBM PC was introduced in August 1981. But the XT, IBM's brilliant final refinement of that design (you should please excuse the feckless XT 286), did not appear until March 1983—almost precisely 18 months later."

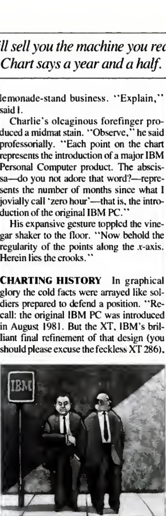


Illustration: Dave Cutler

Charlie inhaled. "Given the dates, calling the AT a mere improvement on the XT would actually support my hypothesis. But I will not attempt to stretch the truth for argument's sake. Let us consider the AT a new departure. As you will remember, IBM chose to release it with a 6-MHz system clock and no hard disk larger than 20 megabytes. Almost precisely 18 months later arrived the product users desired in the first place—the one with the 8-MHz system clock and a 30-megabyte hard disk. Are you beginning to understand?"

I admitted I was.

"Now let us study the sad and singular product history of the IBM portable line. Here, of course, IBM has not been competitive, as reflected in the odd delay of more than 2 years between the introduction of the Portable PC and the Convertible. Still, the recent upgrade of the Convertible comes 15 months after its original introduction. That time period and the fact that the machine is still slower than the process of stalagmite formation keep it from fitting precisely with our hypothesis. But it is, as is said in horseshoes, a definite 'leaner.' "

I smiled. "Your point, then, is that the preferable IBM product, the desirable model, arrives on the scene approximately 18 months subsequent to the original introduction."

"Correct with bells on. I have not been able to get the data on IBM's introduction of PC*jr*'s improved successor—no PC*jr*—but I believe it falls within accepted variance. Now the introduction of the PS/2 line comes just 1 year after the introduction of the 8-MHz AT. Here again, one might simply call this new machine an improvement over its predecessors, but we shall consider it as new.''

Which he did: ''Today's PS/2 line offers mostly 'doesn'ts': the precise configurations the customer doesn't want. The Model 30 doesn't include a 286 processor or the Micro Channel. The Model 50 doesn't include enough slots and doesn't come with a hard disk that can run faster than the eighth nag in a seven-horse claimer. The Model 60 doesn't let you choose the low-end hard disk and then later add a larger-capacity unit from IBM. Actually, the Model 80 doesn't seem a bad choice—provided you're a member of the Fortune 500 or Forbes 400.''

A CLEAN RECORD ''Allow me to make one point,'' I demanded, flipping over my place mat and drawing *x* and *y* coordinates through the tomalley smears. ''Here,'' I stated, ''is IBM's record on certain industry-standard peripherals.''

''Permit me to observe that your chart is blank.''

''Precisely. Multifunction boards, multiscan monitors, speedup cards and crystals, add-in hard disks: you name it, IBM doesn't make it. Or, as with modems, it misses the market entirely.''

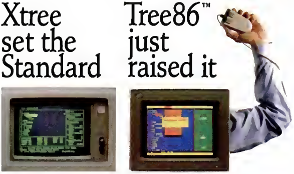
''Are you perhaps implying third-party products are what made the original machines so successful?''

''Indubitably—and in large part because you could buy stripped-down versions of the older models and soup them up with third-party products that beat IBM's 17 different ways, including price. This time around, there's no floppy-only model of anything except the flop (a.k.a. Model 30). You're more at IBM's mercy than ever.''

''True. Now let us create a truly desirable machine. It contains a 386 processor like the Model 80. It sits on your desk like the Model 50 but has a big, fast hard disk and, say, five expansion slots. It comes with 2 or 3 megabytes of memory on the motherboard. It carries a premium price (after all, one pays for technology), but no more than the current Model 60s.''

''In other words, a 386 AT clone,'' I suggested.

Charlie the Chart shook his whole body. ''No, no, no! No good! Too little standardization! Too little future! No, sir! Extrapolate from the evidence, and 18 months from now I will acquire the machine I really want—an IBM Model 70. Provided, of course, IBM is still in the business, having missed 18 months of golden opportunity. Would you care to make a sporting wager? More tripe?''



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"The G/Remote Bridge even provides us with the ability to connect any NetWare LAN to any other NetWare LAN. In fact, we could expand up to 32 LANS in a common worldwide network using X.25 synchronous links, which take care of all the routing and error-correction functions.

Transparent Data Access.

"The best thing about the G/Remote Bridge is once you set up the initial configuration, it is totally transparent to the user. We even run Gateway's G/SNAnet™ mainframe connection over the bridge for 3270/3770 access from our LAN to our IBM mainframe to further expand the information sharing.

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CIRCLE 324 ON READER SERVICE CARD

The TOP 10 Reasons

Reason #1) REALLY Nice People! -- Well, yes the Qubie' staff are nice people, but they are also seasoned professionals. Our courteous Sales/Customer Service Department is staffed with people who can answer any question before you buy and take your order. Our top-notch Technical Support Department (working hours, **M - F 8am - 5pm PTZ, and Sat. 8 11am PTZ**) are as close as a phone call and can answer your questions after you buy. The staff of Qubie' knows it takes excellent service and tech-support to keep customers satisfied.

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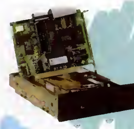
Reason #3) Recommended By Several World Leaders -Well, perhaps not WORLD leaders, but Qubie' customers ARE leaders in the business community -corporations such as Exxon, General Motors, Rockwell and IBM, to name a few, buy peripheral equipment from Qubie' and have been for years; we've been pleasing PC owners since 1982.

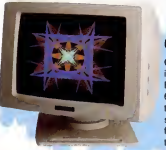
So, please read on for reasons 4-10 and **DISCOVER** for yourself what others have known for so long -- Qubie' MEANS really nice people and really good products (at really low prices!)

Thank You



HARD SOLUTIONS

The PC20 is an internal hard disk subsystem mounted like your floppy that sells for an unbelievable **$309**! The PC20 drive boots directly from the hard disk and does not require software patches. Also included is software that truly enhances the use of your hard disk -- 1dir, the hard disk organizer that makes DOS a snap.



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TRUE PERFORMER

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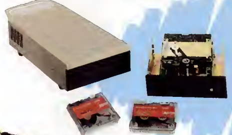

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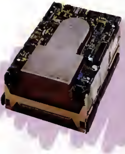
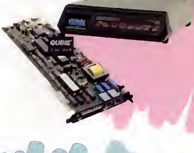


COLD STORAGE

With the BT40, a 40 megabyte drive for your AT priced at **$469**, high reliability is assured through the use of LSI. The head positioning system employs a dedicated surface closed-loop servo and also a linear voice-coil actuator. The heads are automatically positioned and locked over the dedicated head shipping zone at power-down; average access time is 30 msec We also offer BT70's and up starting at **$839**.



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COVER STORY

DIANE BURNS AND S. VENIT

PC DESKTOP PUBLISHING COMES *of* AGE

Now that the market for desktop publishing has begun to grow in great leaps, the four true WYSIWYG packages—*GEM Desktop Publisher, The Office Publisher, PageMaker,* and *Ventura Publisher*—are making their influence felt in a variety of applications.

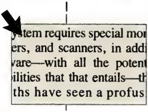
After months of slow simmering, the PC desktop publishing market has caught fire. In 1986, 4,000 desktop publishing packages were sold; estimated sales for 1987 are put at 53,000. And according to DataQuest, a market research firm based in San Jose, California, sales figures for 1990 are projected at more than 300,000.

The projected sales figures for the hardware that is used with desktop publishing software show similar expansion: CPUs used for desktop publishing are expected to jump from 4,000 in 1986 to 53,000 in 1987 and to nearly 400,000 in 1990. Laser printers, 4,000 of which were sold in 1986, are projected at 37,000 units in 1987 and 134,000 in 1990. And scanner sales, at 2,000 in 1986 and 9,000 in 1987, are expected to reach 134,000 in 1990.

Hardware and software manufacturers alike are rushing to cash in on the projected profits. Last September we reviewed nine scanners in our article "Page-to-Disk Technology: Nine State-of-the-Art Scanners" (*PC Magazine*, Volume 5 Number 16); in this issue we've rounded up nearly 30. In last year's printer issue (*PC Magazine*, Volume 5 Number 19) we reviewed 18 laser printers; this year, in Volume 6 Number 19, we look at roughly 40 new laser printers.

And because an entire desktop publishing system requires special monitors, laser printers, and scanners, in addition to the software—with all the potential incompatibilities that that entails—the past few months have seen a profusion of announcements for complete desktop publishing "solutions." Lead by IBM and its SolutionPac Personal Publishing System—an $8,553 bundle that includes the IBM PS/2 Model 30 computer, monitor, printer, and PS/2 mouse, as well as *Microsoft Windows*, Aldus Corp.'s *PageMaker*, and Adobe's PostScript page description language, all preinstalled—the field includes systems from Hewlett-Packard, Epson, Canon, Taxan, AST, Cordata, and Ricoh. For more information on the hardware you'll need to set up a desktop publishing system, see "Desktop Publishing: Outfitting Your System."

One might argue that desktop publishing has been available for the PC for 2 to 3 years in the form of code-based packages, which act as front ends for high-end type-



ystem requires special mo
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setting systems. But the explosion was ignited by the recent availability of another type of page layout product for the PC.

These PC packages strongly resemble their granddaddy, Aldus Corp.'s *PageMaker* for the Macintosh. All of them share a what-you-see-is-what-you-get (WYSIWYG) display on which you can make and view adjustments in page format, font size, character spacing, and so forth. All also share the ability to import text and graphics created by other programs, integrate them into a single document, then print the results on a high-resolution laser printer or phototypesetter.

In particular, to qualify under our definition of a desktop publishing package the program must meet a stringent set of criteria. Each package must allow you to edit text directly on a WYSIWYG view of the page, though the degree to which the screen display matches the printed page may vary between packages. This criterion excluded such packages as *PageBuilder* from White Sciences Inc., *Halo DPE*, and *Publisher's Paintbrush* (an upgrade of *PC Paintbrush*). The package must retail for less than $1,000. We assumed that most desktop publishers would be unwilling to spend more on a page composition system than they had spent on their database package. We also looked at high-end products that are generally designed to be used by professional typesetters and large production houses in "Desktop Publishing: If the Term Fits . . ." Finally, the package must be available now—or at least released by the time this issue goes to press; packages that missed our deadline included Megahaus's *First Impression* and Ashton-Tate's *Bylines*.

Using these criteria—the same ones that we applied when we last looked at desktop publishing in "Muscling In on the Mac: PC-Based Page Composition" (*PC Magazine*, Volume 6 Number 3)—we came up with the four products that we review here: *GEM Desktop Publisher* from Digital Research, Aldus Corp.'s *PageMaker*, Xerox Corp.'s *Ventura Publisher*, and Laser Friendly's *The Office Publisher*.

USES FOR DESKTOP PUBLISHING

As laser printing and scanning technologies have become more sophisticated and less expensive—and as the disparate pieces of hardware and software have become more unified (in packages like IBM's SolutionPac)—more and more people are finding that it makes sense to bring publishing to their own desktop. Moreover, the availability of these packages for the past half year has led to a greater understanding of their uses.

> As laser printing and scanning technologies become less expensive, more people are finding that it makes sense to bring publishing to their own desktop.

While desktop publishing technology was first embraced by hobbyists, small businesses, and adventurous design studios, it has become increasingly recognized as the solution of choice for all types of companies, including major publishers, corporate communications departments, and professional designers and typesetters.

Clearly, PC users have moved beyond the popular perception that desktop publishing is synonymous with newsletters. Corporate users, for instance, now realize that reports have more impact when they are "transformed" from typewriter fonts such as Courier to typeset Times Roman and Helvetica, are gussied up by ruled lines and boxes, and contain figures that appear on the same page they are referred to. Instant printers and copy shops, designers, and free-lance writers are also using this technology to offer typesetting to their clients.

CONFUSION AND A FEW HURDLES

But while buyers are gaining more savvy about the uses for desktop publishing, sorting out the packages has become more of a challenge. Vendors have caused a great deal of confusion in the marketplace by attaching the magic words "desktop publishing" to all sorts of products in the hopes of catching the wave of interest in publishing and riding it to new peaks in sales and profitability. Anyone out there with no experience with typesetting, page layout, and laser printing will be hard-pressed to find his or her way through the advertising hype.

For instance, you could call a word processor such as *XyWrite* or *WordPerfect*, together with a package like *Inset*, a desktop publisher because it will give you multicolumn text along with graphics. You'll also find quite a number of low-end packages masquerading as desktop publishers. These low-cost packages, however, are best suited to producing flyers, since they offer just a few "display type" bit-mapped type styles for dot matrix printers or low-resolution printing on a laser printer but cannot import text and graphics from other programs.

Also, code-based front ends to typesetting equipment, which were mentioned previously, often go by that moniker. While they don't meet our definition, these packages are useful for their purpose and even offer some advantages. Code-based products don't require the extra memory and graphics cards that you need to run WYSIWYG page layout packages, and their faster processing can make a significant difference when you are dealing with a large volume of text. On the other hand, code-based products tend to be more difficult to use than their WYSIWYG counterparts. If you think these applications are more suited to your needs, look for our discussion of some of them in "Desktop Publishing: If the Term Fits . . ."

Although the existence of packages that claim to do desktop publishing helps create the impression that these packages are omnipresent, we found only four packages that met our criteria.

After a mad scramble last year by the major vendors to acquire ownership or marketing rights to page composition packages from independent programmers, few of the promised products have made it to market. Software developers are finding that it's not as easy as they had hoped to create a page layout package. A true page layout package must be able to integrate all formats, support all fonts, and embody all the tools in a graphic artist's studio. Creating a complete page composition package

ATTACKING THE MAC

The PC is certainly putting up a good showing in terms of sales of desktop publishing hardware and software. But it will take some major developments before the PC stands a chance of knocking the Mac out of the arena.

Sixfold increases in sales for PC desktop publishing packages between 1987 and 1990 are certainly impressive. But figures from DataQuest indicate that sales figures for products that run on the Apple Macintosh, which invented the market, still lead those for PC products by about 18 months.

DataQuest predicts that sales of CPUs for desktop publishing on the Mac, which stood at 59,000 in 1986, will be at 92,000 this year and at 534,000 in 1990.

Likewise, software sales for the Mac, which were 58,000 in 1986, and 87,000 in 1987, are expected to jump to 427,000 packages in 1990. Projected sales figures for scanners and laser printers show similar leaps.

In addition, Apple continues to fuel its edge for desktop publishing applications with releases of new hardware products like the Macintosh SE and Macintosh II, and new graphics software like Adobe's *Illustrator*.

Obviously, the Macintosh is in a good position to hang onto its lead over the PC in this arena.

The Mac's advantage over the PC rests in its standard file formats, which make it easy for users to move from one application to the next. All paint programs use the same format (*MacPaint*), and all drawing programs support the PICT format. On the other hand, every new vendor for the PC tends to reinvent the wheel and establish its own file formats. As a result, Mac users can safely assume that their programs will work together on the Macintosh; PC users can't.

This flexibility is more important for desktop publishing than any other application, because such packages often require you to use a variety of packages, graphics, text, and a scanner to produce a final publication.

The issue of homogeneity applies to hardware as well. Even when you buy the Macintosh II—Apple's fastest and most powerful computer—which sports an open architecture, you can take it out of the box and get running in minutes.

Manufacturers of software and hardware for the PC have taken some steps toward resolving some of these issues. For instance, all of the packages for the PC reviewed here now provide some form of common interface. *PageMaker*, for instance, runs under *Windows*, while the other three packages run under GEM.

IBM's SolutionPac—in which you obtain all the hardware necessary for a desktop publishing system, with all the necessary software preinstalled on the hard disk—and desktop publishing hardware/software combinations from other vendors are another significant step.

Analysts claim—and we support the notion—that these steps mean that the PC is moving more and more in the direction of the Macintosh when it comes to desktop publishing. Apple set the standards that IBM must now follow and improve. But it will take a mature family of software that supports OS/2 and the capabilities of the Windows Presentation Manager to make all the pieces of the IBM desktop publishing puzzle fit together as neatly as the Macintosh picture does today. That will take some time. But in the meantime, the PC's growing desktop publishing capabilities mean that you don't have to invest in a Macintosh to get impressive page layouts.

—Diane Burns and S. Venit

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is a much more ambitious endeavor than developing an "integrated" package like *Symphony*, *Framework*, and *Enable*—all considered major innovations in their day. It's not surprising, then, that many of the products that were "not quite ready" for review last February are still under development.

Meanwhile, the products that had the most promise 8 months ago have gained a stronger foothold in the market. Since we last reviewed the major page composition packages, we have seen a maturation of products, but no major innovations.

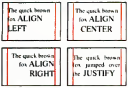
Among the packages that do qualify under our definition of desktop publishing, you'll find various degrees of text and graphics integration and typographical capabilities. *GEM Desktop Publisher*, for instance, which is tailored to a narrow range of applications, offers limited typographical controls and supports few file formats for imported text and graphics. The higher-end packages, such as *Ventura Publisher* and *The Office Publisher*, are suitable for a wide range of publications. They support many graphics programs and word processors and can satisfy the demands of professional designers and typesetters for precision and flexibility. But these greater capabilities are reflected in their prices. While *GEM Desktop Publisher* retails for $395, *Ventura Publisher* and *The Office Publisher* retail for $895 and $995, respectively.

THE TEST PROCEDURE In our testing and reviews of these packages, we have attempted to pinpoint the strengths and weaknesses of each of the tested packages for various types of applications.

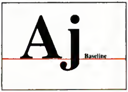
To do so, we built a four-page newsletter and a long, all-text document using five different page layout packages. We started with *PageMaker* for the Macintosh as the "control" in our tests, since that environment is the de facto standard for desktop publishing. We then produced the same

Glossary of Desktop Publishing Terms

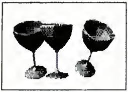
ALIGNMENT How text lines up on a page or in a column: align left (flush left, ragged right), align center, align right (flush right, ragged left), or justify (flush on both the left and right margins).


The quick brown fox ALIGN LEFT
The quick brown fox ALIGN CENTER
The quick brown fox ALIGN RIGHT
The quick brown fox jumped over the JUSTIFY

BASELINE The baseline of a line of text is the lowermost point of letters, not including descenders (the lower edges of "g" and "j" for instance).



BIT MAP Also called raster. A graphic image formed by a matrix of dots with a specific number of dots per inch. *PC Paint*, *GEM Paint*, *Windows Paint*, and *PC Paintbrush* are examples of packages that use bit-mapped graphics.

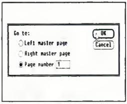


CLIPBOARD A holding place for temporarily storing the text or graphics under *Microsoft Windows*.

CROP To trim material from the outer parts of a graphic image, thereby emphasizing the main part.

DEFAULT The initial setting of a value or option by the program. Default settings can usually be changed by the operator.

DIALOG BOX A window or full-screen display that appears in response to a command that calls for setting options.



Go to:
○ Left master page
○ Right master page
● Page number 1

EMBEDDED CODES ASCII codes typed directly into a stream of text to identify type specifications; usually called "embedded" to distinguish them from the invisible formatting codes created by some systems.

FLUSH See Alignment.

FLUSH RIGHT, OR RIGHT JUSTIFIED Text in which lines end at the same point on the right margin; opposite of ragged right or left justified.

FONT One complete set of characters in the same typeface and size, including letters, punctuation, and symbols; 12-point Times Roman is a different font from 12-point Times Italic, 14-point Times Roman, or 12-point Helvetica.

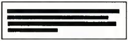
ABCDEFGHIJKLMN
OPQRSTUVWXYZ
TIMES ROMAN

ABCDEFGHIJKLMN
OPQRSTUVWXYZ
HELVETICA

FOOTER One or more lines of text that appear at the bottom of every page.

GENERIC FONT A screen representation of alphanumeric characters on a screen that may not reflect what the final printed characters will look like.

GREEKING The conversion of text to symbolic bars or boxes that show the position of the text on the screen but not the alphanumeric characters.



HEADER One or more lines of text that appear at the top of every page of a document.

HYPHENATION Hyphenation can be achieved in several ways: some programs let you insert "discretionary" hyphens manually (hyphens that are visible only when they fall at the end of a line); some programs insert hyphens automatically based on a dictionary of words; some programs use a logic formula to hyphenate words. Usually, dictionary hyphenation takes longer than logical hyphenation but is more accurate.

H AND J Short for hyphenation and justification.

ICON A functional graphic representation of a tool, file, or command displayed on a screen.

INSIDE MARGIN The left margin of a right-hand (odd-number) page; the right margin of a left-hand (even-number) page. The inside margin is often wider than the opposite margin to accommodate binding.

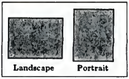
INVERT See Reverse.

JUSTIFIED TEXT Text that is aligned flush at both the left and right edges.

KERNING The amount of space between letters, especially certain combinations of letters that must be brought closer together than others in order to create visually consistent spacing among all letters. The letters AW may appear to have a wider gap between them than the letters MN, for example, unless there is a special kerning formula set up for the AW combination.

ABCDEFG
ABCDEF

LANDSCAPE PRINTING The rotation of a page design to print text and graphics horizontally across the 11-inch width of the paper. See also Portrait printing.



LASER PRINTING Used to describe printing with one of the toner-based laser printers that are available for PCs. Some typesetters also use laser technology in conjunction with their photochemical processing, but these are usually referred to as phototypesetters rather than laser printers.

LAYOUT The arrangement of text and graphics on a page.

LEADERS Dotted or dashed lines that can be defined for tab settings.

Item	Cost
Milk..............................	$0.59
Bread...........................	$0.99
Coffee...........................	$2.99
Butter..........................	$1.99
Eggs.............................	$0.69

LEADING The amount of vertical spacing, expressed in points, between the baselines of two lines of text.

Which though I stay
blameless, if it be no
brings to all who wis
whereof this whole di
mony, if not a trophy.

Which though I stay
blameless, if it be no
brings to all who wis
whereof this whole di
mony, if not a trophy.

LINE SPACING See Leading.

ORPHANS/WIDOWS An orphan is formed when a short line—usually the last line of a paragraph—falls at the top of a column or page. A widow is formed when a single line—usually the last line of a paragraph—has fewer than an agreed-upon number of characters and hence does not meet the visual standards of the publication. Widows and orphans are generally considered not aesthetically pleasing by most publishers. Some packages let you set up automatic controls for the minimum number of lines that can be separated by a page break.

lasy dog.
The quick brown fox jumped over the lasy dog. If ever there was a

---

this would have to be the lasiest.
The quick brown fox jumped over the lasy

PHOTOTYPESETTING Producing a page image on photosensitive paper, as when documents are printed out on a Linotronic 100 or 300 typesetter. This process is sometimes referred to as cold type to distinguish it from the older method of casting characters, lines, or whole pages in lead, known as hot type.

PICA A unit of measure equal to ⅙ inch, or 12 points.

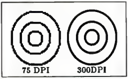
POINT Smallest unit of measure in typographic measurement. There are 12 points in a pica, 72 points in an inch.

PORTRAIT PRINTING The normal printing orientation for a page: horizontal text on an 8½-inch-wide sheet of paper. See also Landscape printing.

POSTSCRIPT A page description language used by Apple's LaserWriter and other high-resolution printers and typesetters.

REVERSE The opposite of the normal appearance of text or a graphic on the printed page. Normally, text and graphics are black on a white background. When reversed, they are white on a black background. Graphics can also be reversed. This option is called "invert" on some systems.

RESOLUTION The number of dots per inch (dpi) used to represent an alphanumeric character or a graphic image. High-resolution images look smoother and have more dots per inch than do low-resolution images. The resolution of images displayed on the screen is usually lower than that of the final laser printout. Laser printers print 300 dpi or more, typesetters print 1,200 dpi or more.



ROMAN Upright (nonslanted) text styles, as distinguished from italic.

ABCDEFGHIJKLMNO
PQRSTUVWXYZ
abcdefghijklmnopqrs
tuvwxyz

UNIVERS 55 ROMAN

RULES OR RULED LINES Black lines of various styles that can be drawn on a page and set to various thicknesses.

RULER Rulers displayed on the screen that show measures against the page layout in inches, picas, or millimeters.

RUNNING HEAD See Header.

SANS SERIF Typefaces without serifs, such as Helvetica, Avant Garde, Geneva. See also Serif.

ABCDEFGHIJKLMNOPQ
RSTUVWXYZ
abcdefghijklmnopqrst
uvwxyz

AVANT GARDE GOTHIC BOOK

SCREEN Gray tone usually identified as a percentage: a 100 percent screen is solid black; a 10 percent screen is light gray.

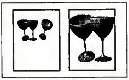
SCRIPT Typeface designed to look like handwriting or calligraphy, such as Zapf Chancery.

SERIF Line crossing the main strokes of a letter. Typefaces that have serifs include Times, Courier, New Century Schoolbook, Bookman, and Palatino. See also Sans serif.

ABCDEFGHIJKLMN
OPQRSTUVWXYZ
abcdefghijklmnopqrst
uvwxyz

PALATINO

SIZE To make a graphic image smaller or larger on a page.



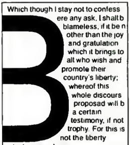
STYLE One of the variations within one family of typeface, such as roman, bold, italic, outline, and shadow.

ABCDEFGHIJKLMNOP
HELVETICA
ABCDEFGHIJKLMNOP
HELVETICA ITALIC
ABCDEFGHIJKLMNOP
HELVETICA BOLD (MEDIUM)
ABCDEFGHIJKLMN
HELVETICA BLACK

STYLE SHEET A collection of type specs and format definitions that can be saved and used in many different documents.

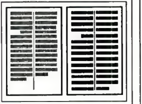
TEXT-ONLY DOCUMENT Text saved without any type specifications or other formatting.

TEXT WRAP The ability to wrap text around graphic images on a page layout. Some systems have an automatic text-wrap feature that will shorten lines of text when a graphic is encountered. In other systems, you need to change the length of lines by changing column margins or by inserting hard carriage returns to shorten lines.



Which though I stay not to confess
ere any ask. I shall b
blameless, if it be n
other than the joy
and gratulation
which it brings to
all who wish and
promote their
country's liberty;
whereof this
whole discours
proposad will b
a certain
testimony, if not
trophy. For this is
not the liberty
which we can hope.

VERTICAL JUSTIFICATION The ability to adjust the spacing between lines of text (leading) in fine increments so as to make columns end at the same point on a page and have pages end at the same point across a layout.



WRAP See Text wrap.

WYSIWYG "What-You-See-Is-What-You-Get," or "whizzywig," is a term used to describe systems that display full pages on the screen with text and graphics. Some programs are more WYSIWYG than others in the accuracy of the display. The term is also used to describe a word processing program whose screen display attempts to represent the appearance of the printed documents—**Diane Burns and S. Venit**

two documents using *PageMaker* for the PC, *GEM Desktop Publisher*, *The Office Publisher*, and *Ventura Publisher*.

To see how each of the packages handled different features, we designed a four-page newsletter that forced us to use nearly every command on the menu of each of these packages. Since short newsletters are not the only type of publication produced in corporations, we also tested flowing a long text file into each package.

By design, our short newsletter incorporated a variety of challenging elements, including the following features:

Imported text The text for each article was imported from *Microsoft Word* (either formatted or saved as a text-only ASCII file). When you import text into page composition software, you should consider whether or not you can also import the formatting. *GEM Desktop Publisher* was the only one of these packages that required you to import straight, unformatted ASCII text, but the degree of formatting that the rest of the packages could import varied. Only *PageMaker*, for instance, could retain indents, tabs, and typefaces from a word processor.

The logo The graphic "BMI" logo was developed in one of three draw programs: *MacDraw*, *GEM Draw*, or *Windows Draw*. Although our specifications included applying a screen pattern to the logo, only *PageMaker* for the Macintosh was able to do so.

Line Art The drawing of the building on page 1 was created in a paint program: *MacPaint*, *Publisher's Paintbrush*, or *GEM Paint*. You save the file on disk, and the package can just read it in. While the .PCX format from *Publisher's Paintbrush* is a widely supported one, *GEM Desktop Publisher* was unable to import such files. Instead, we used *GEM Paint* software for that package.

Scanned images The newsletter incorporates two scanned images: the map on page 2 and the photograph on page 3 (stored as a 300-dot-per-inch high-resolution image file). We used a Microtek scanner and imported the scanned images directly into the page composition program except in the case of *Ventura*, where we saved the files in *Publisher's Paintbrush* format.

A 1-2-3 bar chart We imported a bar chart from Lotus's *1-2-3*, though for *PageMaker* for the Macintosh, we substituted a bar chart produced in *Excel*. All the PC packages except *GEM Desktop Publisher* were able to import these files. *GEM* requires you to use a conversion program for .PIC files, which is available from a third party but not included with *GEM Desktop Publisher* or with *1-2-3*. We therefore left this part of the page blank in our printed examples. We used *GEM Draw* to create the chart for the timed printing tests, however, to get a fair comparison with the packages that could import the chart directly.

Informed buyers tend to favor those packages that already support their current word processing and graphics software. The more file formats supported, the more likely the success of that package.

Column formats The newsletter mixes one-, two-, and three-column formats. All four packages were able to handle these formats easily.

Jumped text Text for the lead article jumps from page 1 to page 4. A second article jumps from page 1 to page 3. We typed in the "continued on page x . . ." line for packages that could not provide this automatically. None could.

Text wrapping The newsletter calls for wrapping text around a graphic in three different ways. On page 1, two-column-wide text changes to one column to accommodate a graphic. On page 2, a graphic falls between two columns of text, forcing each into a half-column wrap. On page 3, the text is intended to wrap along the curved outline of a scan of a man's head. Every program allowed us to change the width of the text in order to wrap it, but only the three GEM-based programs (*PageMaker*, *The Office Publisher*, and *GEM Desktop Publisher*) also offered an automatic text-wrap feature (by opening text up around rectangular frames that contain graphics).

Drop caps Two articles open with initial drop caps—that is, the initial letter in each article was enlarged and positioned so that it extended several lines below the first line of text. *Ventura Publisher* allowed us to use a menu selection. In other cases, we wrapped the text around the drop cap using the same techniques required for wrapping text around graphics.

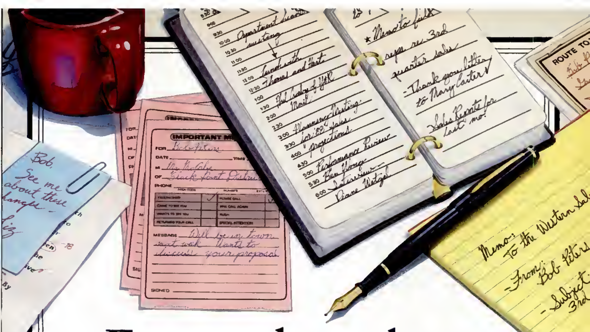
Hairline rules The design called for hairline rules between columns. We had to draw these as graphics in three of the packages. In the case of *GEM Desktop Publisher*, you could create rules using a menu selection, but the program offered no control over the width of the lines.

Running headers and footers The running headers and footers on each page include graphics (shaded rectangles) and page numbers. All of the packages offered some way of entering the text of running headers and footers with automatic page numbering.

Tabs Page 3 includes a table that calls for center-tabbed headings over decimal-tabbed rows of numbers. All four of our packages support these tabbing requirements.

Printouts All of these packages support PostScript-compatible printers, and we designed this newsletter for Apple's LaserWriter because of the nearly infinite range of typefaces and sizes this standard desktop publishing printer offers. The newsletter would have looked very different had we designed it to print on some of the other printers that are supported by these packages. The Hewlett-Packard Laserjet, for instance, offers a limited number of fonts, and you'd have difficulty using it for even the simplest graphics.

Other considerations Besides the features listed above, in every program reviewed we examined and evaluated how the package handled leading (spacing between lines) and kerning (spacing between letters)—two features that are especially important to professional typesetters and designers. We also made note of the number of typefaces offered with each package and the differences between their handling of PostScript-compatible printers as op-


Bob, See me about these changes - Liz
IMPORTANT MESSAGE
FOR Bob Peters
Mr. McCabe
of Stack Point Distri
Will be in town next week. Wants to discuss your proposal
Important luncheon meeting
Lunch with Thomas and Hart
Planning Meeting for '88 sales projections
Performance Review Ben Flores
Interview Dana Wetzel
Memo to file re: 3rd quarter sales
Thank you letter to Mary Carter
Sales Reports for last mo.
ROUTE TO
Memo: To the Western Sal
From: Bob Peters
Subject: 3rd

For people too busy to learn word processing. And too busy not to.

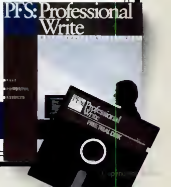
PFS:Professional Write is so easy you can learn it in an afternoon.

Professional Write's design is so intuitive, you may never need the manual. Pull-down menus describe all the functions, and on-line help screens are always available to handle your questions. There's no need to memorize special keys or search through confusing reference cards.

Essential features like the spelling checker, thesaurus and printing functions are only a keystroke away, to save you time and hassles. There's even an integrated address book that automatically inserts names and addresses into letters. And easy keyboard macros speed up repetitive tasks like formatting reports, ending letters or typing standard paragraphs.

Professional Write lets you instantly trade documents with people whose word processors use the IBM DCA format. And you can import data from other PFS: Professional Series applications. It supports all the popular networks, too.

So if you think you can't afford the time to learn word processing, think again. Maybe you can't afford *not* to. Find out how easy it is. Just call for a free trial disk, and see for yourself as you actually create and print your letter with PFS:Professional Write.



For a free trial disk, call 1-408-848-4391, Oper. #14.
PFS:Write owners, call 1-800-255-5550 for upgrade information.

posed to how other output devices, such as the Hewlett-Packard Laserjet, handled them.

We looked at how each package handled overflow text or graphics that needed to be sized or cropped in order to fit on the page. We tried editing text in each package—adding and deleting written material to see how the package handled text adjustments across columns or across pages. We also tried repositioning text and graphics after a page was fully laid out.

All packages must deal with files from a variety of other programs. Most packages will import text and graphics from other programs, then allow you to edit them within the desktop publishing system. Informed buyers tend to favor those packages that already support their current library of word processing and graphics software. Hence the more file formats supported by a page layout package, the more likely the success of that package in the marketplace. You'll find a listing of each program's supported file formats in the features table.

Once you begin to edit with these packages, you'll find that all share the ability to display a full-page view on the screen and an actual-size view, as well as making reductions and enlargements of the actual size. All four packages let you edit the page in every one of these views. All four let you edit text directly on the page layout. Some of the four show "greeked" text in the full-page view, but every package shows text characters in closer views of the page. Screen displays may differ from final output because some packages show text in the font in which it will be printed, while others display only generic fonts on the screen.

TIMED TESTS Finally, we used a stopwatch to time a few procedures as a measure of the volume of work each package would be capable of handling in an average day. In some cases, these tests are no more than rough measures of an operator's subjective experience of "speed." In fact, the difference of a few seconds in opening or saving a file or turning a page may be a measure of a product's complexity rather than its inefficiency.

If you expect to produce a high volume of pages, you need to assess each product's printing speed as well as its processing time. For example, if it takes 30 minutes to print a single page—as it can when you use high-resolution scanned images—and you have only one available printer, you will be able to print only 16 pages during one 8-hour day.

THE TEST ENVIRONMENT We used an IBM PC AT running at 8 MHz with 640K RAM, a 30-megabyte hard disk, a Microsoft Mouse, and an EGA card with Enhanced Color Display. We chose this configuration because it is the most common one used in desktop publishing, rather than the most optimized system. Some of the packages also support a Hercules card and a monochrome screen, but we did not test this setup.

As you'll see in the following reviews, there are a few basic features that all these packages have in common, but there is a wide range of features that are not shared by all or implemented as well in every package. You'll find that each package has its own area of specialty that makes it well suited for certain types of documents but ill suited for others. No single package stands out as *the* solution for everyone, and a careful analysis of your own needs will be well worth while before you decide which package is best for you. You'll find the reviews that followed listed in alphabetical order by product name. The sample test newsletters follow the reviews in the section entitled "Gaining on the Mac."

GEM Desktop Publisher

A low-cost alternative at $395, *GEM Desktop Publisher*, from Digital Research, is designed for offices with modest publishing requirements. As a result, it purposely trades features for simplicity and ease of learning.

For instance, *GEM Desktop* includes no features for creating text or graphics within the package. Instead, *GEM Desktop* will help you lay out and edit only graphics imported from GEM-based graphics programs and .IMG scanner files, as well as text imported from ASCII files and *MultiMate*, *WordPerfect*, *WordStar*, *GEM Write*, and RFT-DCA formats (*DisplayWrite*, *Microsoft Word* 3.0, *WordStar 2000*, Lotus's *Manuscript*, *Samna Word IV*, *PFS:Professional Write*, and *Volkswriter 3*).

FACT FILE

***GEM Desktop Publisher*, Version 1.0**
Digital Research Inc.
60 Garden Ct.
P.O. Box DRI
Monterey, CA 93942
(408) 649-3896
List Price: $395

Requires: 512K RAM, two disk drives, DOS 2.0 or later.

In Short: An easy-to-use package with limited features. You cannot add text or draw graphics from within the program. However, the *GEM Desktop Publisher* style sheets are incredibly useful. Not copy protected.

CIRCLE 649 ON READER SERVICE CARD

On the other hand, *GEM Desktop Publisher* makes the page layout process relatively simple. To begin with, the package uses the interface common to all products that run under GEM, which uses drop-down menus, scroll bars to move the image around on the screen, and scrolling lists of options in a mini-selection box at the left on the screen.

Extremely helpful, too, is the display of coordinates at the mouse pointer that indicate the position of the pointer on the page (from the top-left-hand corner) or the actual size of the rectangle that you are creating or scaling.

To lay out a page, you draw rectangles on the page and fill each one with text or graphics by selecting from a list of files that you've created using other programs. You can work in four different views of the screen—from full-page views of two pages at a time down to a 200 percent enlarged view of a portion of a page.

GEM Desktop automatically repeats the arrangement of rectangles that you set up on the first page on subsequent pages, although you can easily override this default in order to customize a page. Its automatic page formatting allows you to create, in two or three steps, simple documents that repeat the same format on each page—three columns, for instance—with a continuous flow of text

No Other Portable PC Can Make This Statement.

At 6.4 pounds, the new T1000 is the lightest portable PC in the world.

It's a good ten pounds lighter than some "portables." And you know how it feels to carry around ten extra pounds.

Yet within its diminutive footprint (it's about a foot wide and not even that deep) lies all the power of a desktop PC.

Included are 512KB of RAM and a built-in 720KB 3½" floppy drive, plus MS-DOS® 2.11 in ROM.

It comes with a new supertwist screen that's adjustable a full 180°, and folds flat when you want to add a CRT.

The IBM®-compatible T1000 offers you some very intelligent options. Like a numeric keypad and a 1200 bps Hayes®-compatible internal modem. Or an expansion card that will improve its memory by another 768KB.

All in all, it's the perfect way to go to work without going to work. Or to get home early, even when you'll be working late.

Call 1-800-457-7777 for the Toshiba computer and printer dealer nearest you. And see how it feels to pick up the most portable portable in the world. Nothing is as easy to take.

Except, maybe, its price.

MS-DOS is a registered trademark of Microsoft Corporation. Hayes is a registered trademark of Hayes Corporation. IBM is a registered trademark of International Business Machines Corporation.

In Touch with Tomorrow
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Long life and high speed run in our family.

Introducing the LaserImage 3000™ from PCPI. It gives you 15 page per minute speed, 20,000 pages per month capability and the industry's longest life cycle.

The LaserImage 3000 — the most productive laser printer available.

No other laser printer in its class can surpass the 3000's speed. But there is more to productivity than high speed. There's reliability. The LaserImage 3000 is built to last. You can expect a 1,500,000 page life cycle from it's advanced engine. Nationwide on-site service is also available.

Choose the PCPI laser printer that's right for you.

Whether you need the 6 page per minute speed and economy of the LaserImage 1000,™ the 8 page speed of the LaserImage 2000™ or the high speed of the LaserImage 3000,™ you are selecting a printer designed to give you dependability and long life. As with any close family, the LaserImage Series™ printers are fully compatible.

All members of the LaserImage family have a plotter and a graphics printer included.

The LaserImage family emulates LaserJet Plus, Diablo 630, IBM Proprinter, HP plotters and the Epson FX/80 — all standard. If your software works with these, it will work with any of the LaserImage Series printers.

Advanced graphic capabilities.

The LaserImage Series utilizes 100% of the page for graphics with sharp 300 dots per inch resolution. You can print in either the portrait or landscape format with PCPI's full bit map fonts and graphics.

Create the perfect image.

Choose your typeface from 31 supplied near-typeset quality fonts, or select other optional typefaces from the PCPI font library.

Call PCPI toll free for the dealer nearest you.

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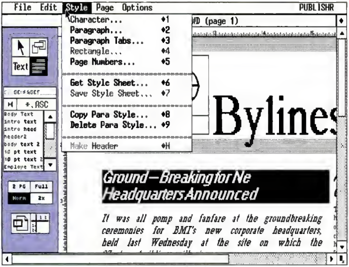
1-800-262-0522

PCPI is a public company whose shares are traded on the NASDAQ exchange.

CIRCLE 176 ON READER SERVICE CARD



Ground–Breaking for Ne Headquarters Announced

It was all pomp and fanfare at the groundbreaking ceremonies for BMI's new corporate headquarters, held last Wednesday at the site on which the

Using a pull-down menu, GEM Desktop Publisher *lets you create style sheets to set formatting definitions for headings and paragraphs within text. To change the font and format for selected elements throughout the document, you simply change the style sheet specifications.*

from one word processing file.

After flowing the text, you can go through the document and format text headings. To open up a space for graphics, you draw a new rectangle anywhere you wish within a column of text. The text in the first rectangle automatically wraps around the second rectangle.

To create more-complex layouts, such as the newsletter we used for our performance tests, you lay out each page individually with rectangles for each text or graphics file. The page layout process is relatively simple and flexible.

Although the page layout process in *GEM Desktop* is simple, the package offers few features that will allow you to create special effects such as hairline rules and boxed text. For these, you'll need to improvise. For example, text and graphics normally extend to the edges of each rectangle. If you'd like a margin of white space around graphics that are surrounded by text, you can draw two rectangles: one to hold the graphic and one slightly larger to push the text from the graphic's edge. Similarly, while you can't make a border around a rectangle, you can jury-rig one by creating an opaque white box on top of a slightly larger black box.

TEXT FORMATTING Text formatting is one of *GEM Desktop*'s great strengths. The package allows you to create style sheets that set formatting definitions for headings and paragraphs within text. In a style sheet, you assign a style name such as "body text," "heading 1," "heading 2," "caption," and so forth to each format used in the document. For each style name, you define the character format (typeface, style, size) and paragraph format (alignment, indentation, tabs, and line spacing).

Once you've defined a style sheet and imported the text, you format the text by selecting each heading or paragraph and clicking on the appropriate style name, which is listed in the mini-selection box on the left of the screen. Different documents can share style sheets, and you can change the font and format for selected elements throughout the document by changing the style sheet specifications.

Besides following the style sheet specifications, *GEM Desktop* also retains the formatting for boldface, underscores, italics, and tabs from supported word processing programs. You can also edit text and change format characteristics such as boldface and underscores within paragraphs by clicking or dragging the mouse to select individual words or phrases.

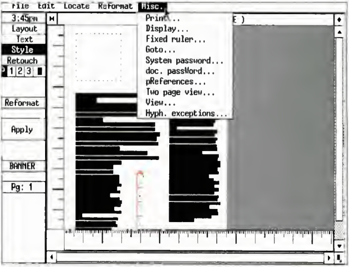
Your choice of typefaces depends on the fonts that you've loaded into the WTABLES.WID file, which is part of the GEM operating system. These include typefaces called Swiss (a serif font like Times) and Dutch (a sans serif font like Helvetica).

You have a choice of only the seven type sizes listed on the menu, from 7 to 72 points. The first three sizes are 7, 10, and 14; however, the sizes most commonly used in body copy (9, 11, and 12) are not included with the default *GEM Desktop* setup. You can purchase additional fonts and sizes that are available from font manufacturers (Adobe, Bitstream) and install them through *GEM Desktop*.

Except for the ability to create shaded rectangles, *GEM Desktop Publisher* has no graphics or drawing features. Instead, you import graphics. *GEM Desktop* automatically scales graphics proportionally to fit the rectangle into which they are loaded. You can also rescale a graphic by changing the size of the rectangle. If the rectangle does not have the same proportions as the graphic, the program will center the graphic, leaving equal margins of white space on either side (or top and bottom) within the rectangle. *GEM Desktop* also offers a cropping feature that makes the image fill the rectangle completely by automatically trimming equal amounts from either side (or top and bottom) of the image.

You can set up a document for either letter-size or legal-size paper and print it in either portrait or landscape orientation.

All of the desktop publishing packages that run under GEM store each document as a series of files. For instance, a .GMP file stores the basic page layouts including the text and graphics, an .STL file stores the style sheet settings, a .WID file stores the width tables required for defining the widths and spaces between characters in various fonts, and .ASC files store information about the text used in the document.



The Office Publisher's *screen redraw is relatively slow compared with the other packages reviewed here, since the package refreshes the screen every time you change a view of the page. But you can speed up the process by suppressing the display of graphics and/or text.*

You need not have all of these files on a disk in order to print the document, however. The Copy Print Files command allows you to copy the files required for printing (such as the .GMP file and an .IMG file for each scanned image used in the document) from the hard disk onto a floppy disk or into another directory for printing on a printer that's not attached to your computer.

INSTALLATION You cannot install or run *GEM Desktop Publisher* without the GEM operating system software (which is sold separately). Once you install the GEM operating system, it takes only a few minutes to install *GEM Desktop Publisher*. The installation program simply presents a series of questions about your equipment configuration and hard disk directory names and copies the program files and drivers from the master floppy disks to the hard disk (or to floppy disks, if you choose that option).

The 150-page manual includes a short tutorial that takes about an hour to complete and introduces the basic principles of the program.

GEM Desktop Publisher is a simple, effective tool for most business applications. It is easy to learn and easy to use as long as your design doesn't require effects that the package doesn't support. Moreover, the style sheets are an incredibly useful feature not offered by any other product in this price range (under $400).

The Office Publisher

The Office Publisher is a recent release from a Canadian company, Laser Friendly, which is a spinoff of Print Three, the largest print shop franchise in Canada. Laser Friendly began developing the product 3 years ago as a typesetting system that would let customers use their PCs to prepare documents for printing on a high-end laser printer or typesetter at a remote location (such as a Print Three print shop). After building the guts of the system to run under MS-DOS, Laser Friendly incorporated the GEM operating environment with WYSIWYG page displays and drop-down menus.

Priced at $995, *The Office Publisher* is clearly a high-end product. This flexible package, which offers a full range of typographic and page layout controls, also incorporates a number of features that no similar product has. Notably, it offers a powerful forms-design feature, the ability to edit imported bit maps pixel by pixel, a floating ruler that you can move around on the page in addition to the rulers at the edge of the screen, and user-definable zoom settings.

You can use keyboard commands for many of the features and create text-only documents with simple formats without using a mouse. For this reason, a mouse is considered optional, but it would have been impossible to build our performance test newsletter without one.

The Office Publisher allows you to specify any page size up to 27 by 27 inches. You begin the page layout process by drawing rectangular areas on the page to hold imported text, typed text, or graphics. The package will automatically apply your first page layout to subsequent pages unless you choose to override this feature. You can also save a page layout as a separate file and use it later in order to format any other page or other documents.

Rectangular areas for text can have their own margins, columns, and borders. The simplest document design would require you to set up a single rectangle on the first page and carry it through the entire document.

PC FACT FILE

***The Office Publisher*,**
Version 1.0
Laser Friendly Inc.
930 Benicia Ave.
Sunnyvale, CA 94086
(408) 730-1921
List Price: $995
Requires: 640K RAM, 20-Mbyte hard disk, DOS 2.1 or later.

In Short: This packages offers the features required by professional publishers. Features unique to this package include a powerful forms-design option, the ability to edit imported bit maps pixel by pixel, a floating ruler, and user-definable zoom settings. Not copy protected.

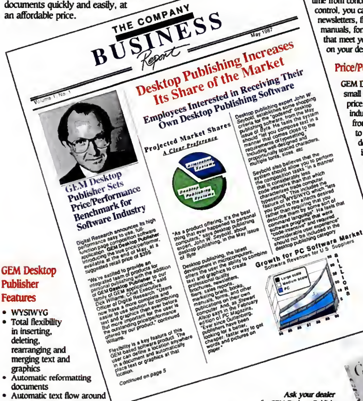
CIRCLE 647 ON READER SERVICE CARD

A Work of Art Without the Work

GEM Desktop Publisher.™

Throw Away Your Scissors, Paste, White-Out, and Frustrations!

Today, GEM Desktop Publisher offers you the ability to combine text and graphics in your documents, giving you more control over your designs, deadlines, and costs. With GEM Desktop Publisher, you can create high-quality documents quickly and easily, at an affordable price.



THE COMPANY
BUSINESS
Report

Volume 1, No. 1

May 1987

GEM Desktop Publisher Sets Price/Performance Benchmark for Software Industry

Digital Research announces its high performance easy to use, full-function page composition software application GEM Desktop Publisher, introducing the true price/performer, available at the end of May, at a suggested retail price of $395

"We're excited to provide an integrated team of products for personal publishing with the addition of GEM Desktop Publisher to our family of GEM applications," said Dick Williams, Chief Executive Officer of Digital Research. "Users now have a more complete and easier to use solution for combining text and graphics than ever before. But more important for the user is the outstanding price/performance offered by our product," continued Williams.

Flexibility is a key feature of this GEM-based software product. The user can define a location anywhere in a document and automatically place text or graphics at that location.

Continued on page 5

Desktop Publishing Increases Its Share of the Market

Employees Interested in Receiving Their Own Desktop Publishing Software

Projected Market Shares
A Clear Preference

Alternative Systems
Desktop Publishing Systems

"As a product offering, it's the best thing that ever happened to personal computers," says desktop publishing expert, John W. Seybold, about desktop publishing, in the May issue of *Byte*.

Desktop publishing, the latest development in microcomputers, offers the user the ability to combine text and graphics to create professional quality brochures, newsletters, fliers, sales reports, marketing briefs, books, manuals, forms, and other publications on their own computer. And, as Stewart Alsop says in the February edition of *PC Magazine*, "Ever since Guttenberg, publishers have been looking for a better, cheaper, faster way to get words and pictures on paper."

Desktop publishing expert John W Seybold, establishes some shopping criteria for the "godsend" desktop publishing software, from the May issue of Byte. He feels the system should "let you compose text in a manner that comes close to the requirements of typesetting," including well-designed and proportionally spaced characters, multiple fonts, sizes, etc.

Seybold also believes that the system should allow you to perform the composition tasks "in a manner that is considerably less code-intensive than that which characterizes trade computer typesetting." This includes the feature of WYSIWYG which "lets you point to the effects desired rather than requiring that you describe them by some sort of command language." He feels that software programs that were "code-intensive" and required "considerable user experience" should not be included in the desktop publishing category.

Growth for PC Software Market
Software Revenues for U S Suppliers

Large scale
Medium scale
PC

BILLIONS

84 85 86 87 88 89 90

Try Your Creativity, Not Your Patience

GEM Desktop Publisher is easy to learn and easy to use. Its icons, drop-down menus, and mouse interface eliminate the need for you to memorize complicated commands. You simply point and click to become productive immediately! Since the turnaround time from concept to finished output is totally under your control, you can create professional-quality brochures, newsletters, fliers, sales reports, marketing briefs, books, manuals, forms, and other publications within time frames that meet your needs. It's like having a small print shop on your desk.

Price/Performance Benchmark

GEM Desktop Publisher is big on performance, yet small on price. At $395, it sets a new price/performance benchmark for the software industry. You get a lot for your money—features from WYSIWYG (what you see is what you get), to style sheets, help you create high-quality documents. And none of your existing software is obsolete with GEM Desktop Publisher. You can use word processing files and keyboard commands from popular word processors, such as Word Perfect®, MultiMate™, WordStar™, GEM Write™, and IBM® DisplayWrite™, as well as text in DCA and ASCII file formats. You can incorporate data created using other GEM applications, such as GEM Paint™, GEM Draw Plus™, GEM Graph™ and GEM WordChart™. GEM Desktop Publisher is completely useable with the hardware you have today and the hardware you plan to purchase tomorrow, including the IBM PC series, 100% compatibles, the IBM Personal System/2™ family of computers, and any Intel® -based microcomputer where GEM System Software is installed. A wide range of dot matrix, laser printers, and other devices are supported for output.

GEM Desktop Publisher Features

- WYSIWYG
- Total flexibility in inserting, deleting, rearranging and merging text and graphics
- Automatic reformatting documents
- Automatic text flow around graphics rectangles
- Style sheets
- Automatic scaling of graphics
- Multiple fonts in multiple sizes, many colors and many styles
- Import text and commands from your favorite word processor
- Page numbers, headers and footers
- Compatible with other GEM applications
- Compatible with many output devices

Ask your dealer
for GEM Desktop Publisher,
to create documents that you can be
proud of, easily, quickly, and at an affordable price.
For more written information, contact Digital
Research Inc. at 1-800-443-4200.

DIGITAL RESEARCH®

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CIRCLE 238 ON READER SERVICE CARD

Page Composition Software: Summary of Features

(Products listed in ascending price order)

GENERAL FEATURES

	GEM Desktop Publisher	PageMaker (Mac version)	PageMaker (PC version)	Ventura Publisher	The Office Publisher
Version	1.0	2.0	1 0a	1.1	1 0
Manufacturer	Digital Research Inc	Aldus Corp	Aldus Corp	Xerox Corp	Laser Friendly Inc
List price	$395	$495	$695	$895	$995
No. of pages per document	100	128	128	Memory dependent	Unlimited
Color options	●	○	○	●	○

PAGE LAYOUT FEATURES

	GEM Desktop Publisher	PageMaker (Mac version)	PageMaker (PC version)	Ventura Publisher	The Office Publisher
Max. no. of columns	4 per frame	20 per page	20 per page	8 per frame	29 per frame
Allows unequal column widths	●	●	●	●	●
Adjusts text if columns change	●	○‡	○	●	●
Automatic text flow	●	○	○	●	●
Stores text overflow	●	●	●	●	●
Inserts/removes pages	●	●	●	●	●
Rearranges pages	○	○	○	○	○
Headers/footers	●	●	●	●	●
Automatic page numbering	●	●	●	●	●
Automatic index generation	○	○	○	●	●
Automatic table-of-contents generation	○	○	○	●	●
Automatic footnoting	○	○	○	●	○
Automatic figure numbering	○	○	○	●	○
Automatic widow/orphan control	○	○	○	●	●*
Automatic continued lines	○	○	○	●	○
No. of ruler measures	2	4	4	3	4
Shows cursor position on ruler	○	●	●	●	●
Shows cursor coordinates	●	○	○	○	○
Shows size of a selected graphic	●	○	○	○	● (floating ruler)
Stores unused text/graphics (in a list or pasteboard)	List	Pasteboard	Pasteboard	List	List

TEXT FEATURES

	GEM Desktop Publisher	PageMaker (Mac version)	PageMaker (PC version)	Ventura Publisher	The Office Publisher
Text formatting					
Links page layout to text files	○	Optional	○	●	○
Retains some word processor formats	○	●	●	●	●
Retains indents and tabs from word processor	○	●	●	○	○
Retains typefaces from word processors	○	●	●	○	○
Embeds type codes	●	○	○	●	●
Has style sheets	●	○	○	●	●
Uses dictionary hyphenation	○	●	●	●	●*
Uses logic/formula hyphenation	○	○	○	●	●
Hyphenates foreign languages	○	○	○	●	●
Has kerning tables	○	●	●	●	●
Allows manual kerning	○	●	●	●	●
Increments by leading	Hundredths of an inch	Half point	Half point	Hundredths of an inch	Tenths of a point
Tabs	●	●	●	●	●
Tab leaders	○	●	●	●	●
Max. no. of typefaces	2	Unlimited	Unlimited	Unlimited	Unlimited
No. of type styles	4	4	4	4	4
Small caps, all caps	○	●	●	●	All caps
Superscript/subscript	○	●	●	●	●
Reverse type	●	●	●	●	●
Size range (points)	7–72	4–127	4–127	1–254	5–252
Size increments (points)	8 predefined sizes	Integers	Integers	Integers	Integers
Text editing					
Edits text globally	○	○	○	● (using word processor)	○
Changes type specs globally	●	○	○	●	●
Changes paragraph form globally	●	○	○	●	●
Has Undo command	○	●	●	●	○
Text import					
ASCII	●	●	●	●	●
DCA	●	●	●	●	●
Microsoft Word 3.0	○	●	●	●	●
MultiMate	●	●	●	●	●
WordPerfect	●	●	●	●	●
WordStar	●	●	●	●	●
Xerox Writer	○	○	○	●	○
XyWrite	○	●	●	●	○
Windows Write	○	●	●	●	○
GEM Write	●	○	○	○	○
Other word processors	○	●	○	○	○

GRAPHICS FEATURES

	GEM Desktop Publisher	PageMaker (Mac version)	PC PageMaker (PC version)	PC Ventura Publisher	The Office Publisher
Graphics import					
AutoCAD	○	○	●	●	○
Windows Draw	●†	○	●	○	○
HPGL	○	○	○	●	○
GEM Draw	●	○	○	●	●
Mentor Graphics	○	○	○	●	○
GDI Metafiles	○	○	●	○	○
.PIC files	●†	○	●	●	●
In*a*Vision .PIC	●†	○	●	○	○
GEM Graph	●	○	○	○	○
Video Show	○	○	○	●	○
Macintosh PICT	○	●	○	●	○
PC Paintbrush	●†	●	●	●	●
PC Paint	●†	●	●	●	●
Publisher's Paintbrush	●†	●	●	●	●
Windows Paint	●†	●	●	○	●
GEM Paint	●	○	○	●	●
Halo DPE	○	○	○	○	●
MacPaint	●†	●	●	●	○
Encapsulated PostScript	○	●	●	●	○
Scanned images	●	●	●	● (via *PC Paintbrush*)	●
Built-in graphics elements					
No. of rules	None	17 widths	17 widths	Unlimited no of widths	Unlimited no of widths
Reverse rules (white lines)	○	●	●	●	○
Rectangles	●	●	●	●	●
Rounded corners	○	●	●	●	○
Circles/ovals	○	●	●	●	○
Polygons	○	○	○	○	●
No. of fill patterns	9	17	17	9 (plus colors)	6
Freehand-drawing options	○	○	○	○	○
Graphics manipulation					
Scaling	●	●	●	●	●
Cropping	●	●	●	●	●
Rotation	○	○	○	○	○
Undo	○	●	●	●	○

PRINTERS SUPPORTED

	GEM Desktop Publisher	PageMaker (Mac version)	PC PageMaker (PC version)	PC Ventura Publisher	The Office Publisher
Laser Printers					
AST TurboLaser	○	○	○	●	○
Canon LBP-8A1 and LBP-8A2	○	○	○	○	●
Cordata printers	○	○	○	●	○
Epson GQ-3500	○§	○	○	○	○
Epson LQ series printers	●	○	○	○	○
HP LaserJet and compatibles	●	○	●	●	●
IBM Quietwriter Models 2 and 3	○§	○	○	○	○
IBM Pageprinter	○§	○	●	○	○
Interpress printers	○	○	○	●	○
Apple LaserWriter	●	●	●	●	●
Other PostScript printers	○§	●	●	●	●
Printware Model 720IQ	○	○	○	○	●
Ricoh PC LASER 6000	○	○	○	○	●
Ricoh LP 4080R	○	○	○	○	●
Xerox 4045 Laser CP	○	○	○	●	●
Laser printer controller board					
Tall Tree JLaser	○	○	○	●	○
Color ink jet printers					
Diablo C150 color ink jet	○§	○	○	○	○
Hewlett-Packard ThinkJet	○§	○	○	○	○
IBM Color Jetprinter	●	○	○	○	○
Quadram Quadjet 9000	○§	○	○	○	○
Xerox Model 4020	●	○	○	●	○
Other color ink jet printers	●	○	○	○	○
Dot matrix printers					
Apple ImageWriter	○	●	○	○	○
Epson FX-86	●	○	●	●	●
IBM Proprinter	●	○	●	●	●
Other dot matrix printers	●	○	●	●	●
Other devices					
Diablo 630 Daisywheel	●	○	○	○	○
Plotters	○§	○	○	○	○
Polaroid Palette film recorder	○§	○	○	○	○
Max. no. of printers	3	32	10	5	Unlimited

PC —Indicates Editor's Choice ●—Yes ○—No

* *The Office Publisher* issues a warning about widows and orphans, calling for user intervention.

† With *The Graphics Link* from PC Quik-Art.

‡ *PageMaker* 2.0 for the Macintosh accepts bit-mapped images and PICT files from the PC.

§ Digital Research offers free driver packs for these printers, but they are not packaged with *GEM Desktop Publisher.*

The Office Publisher offers graphics tools that are part of a library of special graphics objects, such as polygons, that you can modify and import.

More-complicated page layouts, like those in our newsletter, require several rectangles per page. If you layer rectangles, the text in rectangles on lower layers will automatically wrap around those on higher layers. A particularly powerful feature is that you can rearrange the sequence of layers by entering "priority" numbers for each layer in a dialog box.

Another powerful and timesaving feature is the package's automatic forms design. You can specify the line width and space between lines to create a horizontal or vertical grid of evenly spaced ruled lines in a rectangle.

VIEWING THE PAGE *The Office Publisher* lets you zoom in and out among five different views of the on-screen page. It allows you to view any two pages on the screen simultaneously: they need not be left-right pages or contiguous pages.

While the on-screen text display accurately reflects the placement of printed characters, based on the printer you specify, *The Office Publisher* displays most fonts in one of the generic screen fonts available through GEM's screen drivers. However, Laser Friendly does package its own screen drivers and several Intellifonts (bit-mapped fonts from CompuGraphic) with *The Office Publisher*, and these bit-mapped printer fonts give you a more accurate screen representation of how the printed font will look.

The screen redraw, however, is slow compared with that of the other products we review here, and the package refreshes the screen every time you change a view of the page or call up a dialog box—a very frequent occurrence. You can speed up the process by minimizing the number of graphics elements on the display (hiding the grid and the rulers, for example) or by using a menu command to suppress the display of graphics and/or text.

That the size of a single document is limited only by the space available on your hard disk has two potential drawbacks. First, any program with such large files will be slower in executing certain commands than will one with small files. Second, it's more difficult to back up files larger than 800K onto floppy disks.

Like most of the other packages, *The Office Publisher* stores documents in a number of files. A document can be composed of one or more page layout files, a style sheet file, individual text files, individual graphics files, and references to forms and grouped objects from the object library.

To print a document on a remote printer, you can create a print file of the document (using the Print command in *The Office Publisher*). If the print file takes more memory than your 360K or 1.2-megabyte disks, you can use the DOS BACKUP command to copy the print file onto several floppies. At the remote site, you use the RESTORE command to put the print file onto the hard disk before printing. If you are seriously trying to produce a 32,000-page book (*The Office Publisher*'s ultimate page limit), you will probably want to divide it into small sections anyway for distribution among a production team.

TEXT You can type text directly into *The Office Publisher* or import it from other programs. While you can import any ASCII text file directly, you must convert text that has been formatted in a word processor before importing it to the page. *The Office Publisher* retains some formatting from word processors, such as boldface and underscores, but it automatically sets all imported text in the paragraph format, typeface, and size specified for the "body text" style sheet. Style sheets can be saved as a file that any number of documents can share, and you can reformat an entire document by changing the style sheet.

Laser Friendly's style sheet implementation is unique and more flexible than that of our other review programs in several ways. For example, you can set up style sheet definitions that carry a different style specification for selected words or phrases within paragraphs. You can also view or print style sheet specifications, as well as keep a log of the changes you have made to the file—two features not offered by other programs in these reviews.

The package allows you to adjust point sizes from 5 to 252 (for printers that support that range) and change the leading in increments of tenths of a point. You can adjust letterspacing (kerning) manually or by simply activating the kerning tables; you can also define the size and positioning of superscripts and subscripts. You can use a wide variety of measures in setting up type specifications, including inches, centimeters, picas, points, ems, ens, or dots (300 or 1,200 dots per inch). You can also skew text to any angle to produce customized "italics" on PostScript-compatible printers.

Text is hyphenated using a hyphenation formula developed by Proximity that is said to be extremely fast and accurate. The package checks words against an exception dictionary to which you can add your own terms. If you choose to limit the number of lines hyphenated in a row, or if you select automatic widow and orphan control, *The Office Publisher* will issue a warning whenever it finds the conditions you specify, and you can intervene to fix the bad line break, page break, or column break.

The Office Publisher offers automatic generation of an index and table of contents based on flags that you can enter for index terms and heading levels in the text.

GRAPHICS *The Office Publisher* offers graphics tools for lines, rectangles, and polygons. These tools are unique because, unlike those of the other review packages, they are part of a library of special graphic's objects, such as lines, squares, and polygons, that you can modify and import onto a page. You can edit these objects by moving the vertices (corners), combine several objects, and save modified versions in the same object library, but you cannot otherwise originate a drawing.

You can import scans and bit-mapped images from any PC paint program. *The Office Publisher* is the only page composi-

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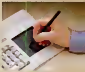

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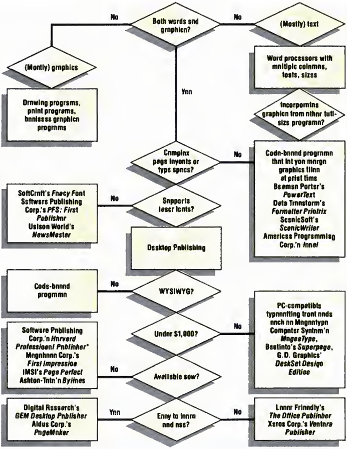
Desktop Publishing Decision Guide

This chart should help you zero in on the most suitable of the four WYSIWYG (what-you-see-is-what-you-get) desktop publishing, or page composition, packages. In the table at the bottom of the page, the four products reviewed here are arranged from left to right in order of increasing price ($395 to $995), complexity, and capability.

Key differences among page composition programs include the learning curve, ease of use, variety of graphics images that can be included (vector, or object-oriented, graphics are more limited than bit-mapped graphics in desktop publishing applications), ease of editing text (*Venture Publisher* even ripples changes back to the original document), ability to replicate page design elements in multiple documents, length of documents that can be comfortably accommodated, and types of printers each program supports. All these programs work best with a mouse or other graphics input device, an AT compatible (8088-based systems are too poky), and an EGA, Hercules, or better-resolution monitor.


No
Both words and graphics?
No
(Mostly) text
(Mostly) graphics
Word processors with multiple columns, fonts, sizes
Drawing programs, paint programs, business graphics programs
Yes
Incorporates graphics from other full-size programs?
Complex page layouts or type specs?
No
Code-based programs that let you merge graphics files at print time
Beeman Porter's *PowerText*
Data Transform's *Formatter Printrix*
ScenicSoft's *ScenicWriter*
American Programming Corp.'s *Inset*
SoftCraft's *Fancy Font*
Software Publishing Corp.'s *PFS: First Publisher*
Unison World's *NewsMaster*
No
Supports laser fonts?
Desktop Publishing
Code-based programs
No
WYSIWYG?
PC-compatible typesetting front ends such as Magna Computer Systems' *MagnaType*, Bestinfo's *Superpage*, G.D. Graphics' *DeskSet Design Edition*
No
Under $1,000?
Software Publishing Corp.'s *Harvard Professional Publisher**
Megahaus Corp.'s *First Impression*
IMSI's *Page Perfect*
Ashton-Tate's *Bylines*
No
Available now?
Digital Research's *GEM Desktop Publisher*
Aldus Corp.'s *PageMaker*
Yes
Easy to learn and use?
No
Laser Friendly's *The Office Publisher*
Xerox Corp.'s *Ventura Publisher*

*Status of product uncertain at the time of publication.

Program strengths	*GEM Desktop Publisher* Digital Research Inc.	*PageMaker* Aldus Corp.	*Ventura Publisher* Xerox Corp.	*The Office Publisher* Laser Friendly Inc.
Allows heavy editing throughout production	○	○	●	○
Imports and lays out multiple pages of text in one step	●	○	●	●
Uses style sheets to format text	●	○	●	●
Does bit-mapped graphics	●	●	●	●
Does vector graphics	○ (conversion required)	●	●	●

●—Yes ○—No

(continues)

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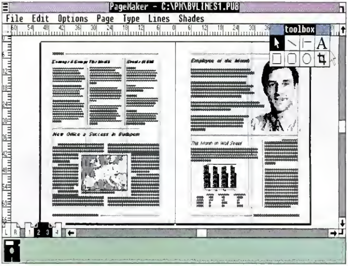

PageMaker *allows you to work on two facing pages at once. Text in smaller point sizes is "greeked" in reduced views of the page.* PageMaker's *built-in graphics tools, which let you draw lines, boxes, circles, and so on, are constantly displayed in a window on-screen.*

tion package we know of that lets you edit imported bit maps pixel by pixel, with the ability to zoom in to an area and work at 300 dots per inch. You can also select parts of a bit map and invert them or mirror them across the horizontal or vertical axis, or clip them and save them as a separate graphics file.

The package also supports object-oriented graphics from *GEM Draw*, as well as .PIC files from Lotus's *1-2-3* and *Symphony*. You can scale and crop all packages directly in *The Office Publisher*.

The Office Publisher comes on 11 disks. As with other page composition packages reviewed here, installation consists simply of answering a series of questions about your equipment setup and directory names.

The Office Publisher offers the full range of features required by professional publishers and could be a strong contender against other page composition programs in this price range. However, its success will ultimately be determined by factors such as product reliability, customer support, and whether a Canadian package can be marketed sucessfully in the United States. With all of its sophisticated features, *The Office Publisher* will take some time to learn, and new users will appreciate formal training and a "hot line" to knowledgeable problem-solvers.

PageMaker

Released for the Apple Macintosh in July of 1985, Aldus Corp.'s *PageMaker* is the grande dame of desktop publishing packages. It is also the de facto standard for desktop publishing features, having sold more than twice as many packages as any of its competitors. As a result, you can be sure that every other developer of page composition software for the IBM studied *PageMaker* carefully before finalizing its programs.

We first reviewed a prerelease version of *PageMaker* in "Muscling In on the Mac: PC-Based Page Composition" (*PC Magazine*, Volume 6 Number 3). Here, we review Version 1.0a. This latest version adds an improved LaserWriter driver and fully supports file transfers between the PC and the Macintosh. (Version 1.0 supported transfers in one direction only, from the IBM to the Macintosh.)

The latter addition further enhances *PageMaker*'s unique ability to straddle both the PC and Macintosh marketplaces. The package looks and "feels" exactly the same on both machines, giving *PageMaker* the advantage over all other PC page layout products of having an installed base of over 50,000 users who have already been trained on and are used to the Macintosh version.

PageMaker remains an exceptional page layout package in many other respects as well. For instance, *PageMaker* is the only available page layout package that runs under *Microsoft Windows*. (If you don't already own *Windows*, you can still run the package under an abbreviated runtime version of *Windows* that is included.) This decision has paid off handsomely for Aldus since several major manufacturers—including IBM and Hewlett-Packard—have agreed to bundle *Windows* and *PageMaker* with their hardware in order to market complete desktop publishing systems. IBM will also be including *PageMaker* and *Windows* with the IBM Personal Pageprinter and adapters in an upgrade kit for XTs and ATs.

USING THE PACKAGE *PageMaker*'s popularity is due in large part to its ease of learning and use. Installation takes about 15 minutes. A tutorial that includes six short lessons gives you a good, quick overview of the program's operation, while the 300-page user manual and the 150-page reference manual are easy to follow and serve as models for page design. The company also offers a free booklet of design tips and is in the process of producing a series of template packages and instruction guides that include design tips.

PageMaker allows you to work in up to four different views of the page and (optionally) to work on two facing pages at once. Text in smaller point sizes is "greeked" in the reduced views of the page, but both the greeked and normal views of the text show accurate representations of the fonts used.

While the program lets you create documents up to 128 pages long, you will probably want to keep document files shorter so you can back up onto floppy

BAD BACKUP
TAPE BACKUP

disks. You can also compose a long publication of more than one *PageMaker* file, specifying the starting page number in the Page Setup dialog box for each file.

To lay out a page with *PageMaker*, begin by defining general characteristics that apply to an entire document, such as the page size and margins. *PageMaker* is unique in that it does not confine you to predefined page sizes; instead, you can specify any page size up to 17 by 22 inches.

Next, you format the master page by specifying column guides and elements that repeat on every page, such as headers and footers. The column format set up on the master page will automatically apply to every page in the document, though you can also easily override these master settings on any page.

Once you've defined the margins and columns, you can type text directly onto the page, use *PageMaker*'s built-in drawing tools to create graphics, or import text and graphics from a wide selection of other programs. Imported text retains all of the formatting from supported word processing programs, including margins, indents, tabs, and type specifications. However, since there is no link between the *PageMaker* file and the imported word processing files, edits made in *PageMaker* are not reflected in the original version of the document.

EDITOR'S CHOICE

PC MAGAZINE FACT FILE

***PageMaker*,**
Version 1.0a
Aldus Corp.
411 First Ave. South,
#200
Seattle, WA 98104
(206) 622-5500
List Price: $695

Requires: 512K RAM (640K RAM recommended), one disk drive, one 10-Mbyte hard disk, *Microsoft Windows*, DOS 3.2 or later.
In Short: *PageMaker*'s strengths lie in its flexiblity for quick edits. It also features an intuitive menu structure and good graphics and layout features. But its lack of style sheets—plus the fact that it doesn't flow text from page to page—makes its use tedious for long documents. This product can share files with the Mac version. Not copy protected.

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Tremendously convenient are *PageMaker*'s keyboard shortcuts, which speed up common commands such as bold and italic and increase or decrease the point size of selected type.

PageMaker gives you a great deal of flexibility in manipulating your page layouts. For instance, imported text can either flow into the predefined columns, or you can use the mouse to define an alternative space on the layout for it. Other packages, in contrast, require you to change modes or use dialog boxes in order to change column widths. The package then automatically hyphenates text—unless you turn this feature off.

But the price for flexbility is that *PageMaker*'s process for laying out full pages is less automatic than that of some of the other packages. For example, unlike other packages that automatically fill whole pages or documents with text, *PageMaker* requires you to flow the text one page at a time.

Placing a graphic element on a page is as flexible a process as moving text in *PageMaker*. You place graphics onto the page in their original size, then scale and crop the image to any size you choose. You can also define a rectangular area into which to place the graphic. To wrap text around a graphic, you must break the text into several text blocks and use the mouse to change the width of each one. But while this process is both easy and flexible, it is more time-consuming than the automatic text-wrap features that are offered by other programs.

To align objects on a page, you can use either the column guides, which appear as dashed vertical lines on the screen display, or position horizontal and vertical ruler guides. *PageMaker* is the only package that offers a viewable "pasteboard" area on the screen where you can store text and graphics elements that have not yet been positioned on the page layout.

TEXT FORMATTING After you've placed text on a page, you can edit or change its format. Text can be any size between 4 and 127 points and can be printed in black or reverse type. *PageMaker* supports the full range of tabs (left, right, centered, and decimal) and offers three styles of tab leaders (dots, dashes, and solid lines) as well as allowing customized tab leaders. You can adjust the spacing between lines in half-point increments (thus making spacing less flexible than that of the other packages reviewed here). You can also control spacing between words and between letters of justified text, set up automatic kerning for text above a specified point size, and adjust the kerning between pairs of letters manually.

Tremendously convenient are *PageMaker*'s keyboard shortcuts, which speed up common commands such as bold and italic and increase or decrease the point size of selected type.

However, while these keyboard shortcuts make quick changes a snap with *PageMaker*, its lack of user-defined "macros," or style sheets, make the process of formatting long documents a tedious one indeed. For example, rather than allowing you to simply define a single-heading format that would apply to every page in a report, *PageMaker* requires you to repeat the formatting commands for each individual heading.

In addition, editing and formatting text with *PageMaker* is a relatively slow process compared to most word processing programs because the processing and screen redraw can take several seconds for each edit.

PageMaker's built-in graphics tools let you draw lines, boxes with squared or rounded corners, and circles or ovals. Lines can be set in black or white reverse type, available in eight widths ranging from hairline to 12 points, as well as nine patterns such as double hairlines, dashes, dots, and so on. Sixteen different fill patterns are available for solid objects (boxes and circles), including dot-screen patterns from 10 to 80 percent. While these features

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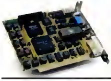

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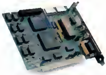

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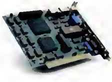
PC MAGAZINE EDITORS' CHOICE



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Aren't you hungry for better graphics? Why not taste all the appetizing graphics options from Quadram. They're all on the menu at a nearby Quadram dealer, your neighborhood graphics shop. For the name of a dealer near you, contact Quadram at One Quad Way, Norcross, GA 30093. Or call 404/564-5566.

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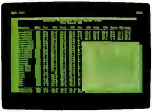
CIRCLE 189 ON READER SERVICE CARD

Hercules Runs Lotus Better.

In 1982, Hercules first made it possible for 1-2-3 to display graphs on an IBM PC's monochrome monitor. We improved the performance of Lotus software then, and we do it now in powerful, new ways.



1-2-3 displays nearly twice the data with no loss in scrolling speed, plus a pop-up graph window, using the Hercules RamFont mode.

Here's How.

High Resolution Graphics: Lotus software benefits from Hercules' crisp 720x348 resolution—the highest popularly supported standard—in monochrome or full color.

RamFont: Hercules' exclusive new mode improves the text processing performance of many Lotus programs by letting them display up to 3,072 software definable characters instead of the fixed 256 ASCII character set.

Mono & Color Compatibility: You get the most from your Lotus programs because our Graphics Card Plus and new InColor Card are completely compatible with each other. So you can easily move your software from mono to color systems and back again, without worrying about video drivers. And the InColor Card will run the thousands of programs that run on our monochrome cards.

Better Looking 1-2-3 and Symphony.

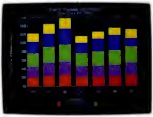
Lotus 1-2-3 (2.0) and Symphony use RamFont to nearly double data display from 2,000 to about 3,400 characters by expanding the spreadsheet from 80 columns by 25 rows, to 90 columns by 38 rows—with no loss in scrolling speed.

The ability to see more data on screen is a powerful advantage to spreadsheet users.

RamFont also allows you to pop-up a graph window right on your 1-2-3 spreadsheet.

RamFont Optimizes Manuscript.

Only Hercules RamFont lets Lotus Manuscript display italics, subscripts, superscripts, other attributes and many equations in the text-processing mode. Manuscript also uses our high resolution graphics for its "page preview" feature.



Hercules 720x348 graphics are the highest popularly supported resolution—15% higher than EGA.

And, of course, Hercules graphics cards run all other Lotus programs such as HAL, Freelance, and Measure. In fact, we'll make most popular software programs run better or look sharper on your IBM PC/XT/AT or compatible.

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(For multi-synchronous and enhanced color "EGA-type" monitors.)

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- *Standard Text—All programs run in 2 or more colors.*
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CIRCLE 142 ON READER SERVICE CARD

Performance Tests: Page Composition Software

(Times given in seconds except where noted)

Our performance tests are designed to indicate the length of time it takes for these packages to perform some frequently used functions. We used two versions of our newsletter for these tests: one version that contains both text and graphics; the other, text only.

We performed all tests using an 8-MHz IBM PC AT with 640K bytes of RAM and a 30-megabyte hard disk. For our printing tests, we used the Apple LaserWriter, since it is currently the most commonly used PostScript-compatible printer. We did not perform our printing tests on the Hewlett-Packard Laserjet or Laserjet Plus because we could not do so without changing some elements in the newsletter design, such as the sizes of some of the fonts. For *PageMaker* (Mac Version), we used a Macintosh Plus with 1 megabyte of RAM, a DataFrame 20-megabyte hard disk, and an Apple LaserWriter.

We conducted all tests three times; the results given are an average of the three times.

FILE SIZE

File sizes among the packages reviewed vary from 22K to 361K for text files alone, and from 57K to 513K for files containing graphics and text. These differences are due primarily to the way the packages store and interact with the origin files.

Moreover, files for different purposes are stored differently. For instance, some packages, such as *Ventura Publisher* and *The Office Publisher*, store print files differently from edit files. Moreover, there is no standard method used by these packages to store files. We therefore measured the included file sizes of all files necessary for editing our entire four-page newsletter.

Sizes shown for *PageMaker* on both the Macintosh and the PC include the size of the *PageMaker* document file and the size of the file used to store the scanned face on page 3 of our newsletter.

Ventura Publisher stores file formatting information, text, and graphics in separate files. The file sizes recorded here are the sum of the sizes of all those files. Because *Ventura* is linked to all source files, it requires all those files to be resident for editing the file. Since *The Office Publisher* uses the same method as *Ventura*, we included the sum of file sizes for all source files.

GEM Publisher uses a single file that includes all text and graphics.

OPEN OR SAVE A FOUR-PAGE FILE

We began the test for opening a file after the program was up and running. We started the timing after we entered the command to call up the four-page file and ended the timing once the program had drawn page 1 on the screen.

For the save test, we made the same text edit to a headline in the newsletter file of each package, then saved the file. Some programs save only the file, or that part of the file, that was changed since the last save. *GEM Publisher* and *The Office Publisher* save the entire file, requiring more time for each save.

TURN PAGE

We timed how long it took to turn from page 1 to page 2 in each package. Because the screen must be redrawn each time you turn a page, this process takes longer than you might expect. Some programs will store graphics in RAM after they have been loaded; calling them up a second time is, therefore, much quicker than the first time. For these tests, however, we loaded the map on page 2 into memory each time.

PRINT TO APPLE LASERWRITER

The time it takes to print a document could be the most significant variable in a heavy production environment. Even though the print engine in the LaserWriter is technically capable of printing 8 pages per minute, the fact is that graphics take a long time to print. (Notice that we timed these tests in minutes and decimal minutes.)

The most time-consuming part of printing a document is processing that document for printing. We timed printing from the moment the print command was invoked until the edge of the page first appeared out of the printer.

In each timed test, the first time was recorded after reinitializing the printer, since most programs send down a PostScript file that stays resident in the printer for all subsequent printing. The second and third times were taken without reinitializing the printer; results shown are an average of all three times.

	File size (bytes)		Open a four-page file		Save a four-page file		Turn page		Print to Apple LaserWriter (minutes)	
	Text only	Text and graphics	Text only	Text and graphics	Text only	Text and graphics	Text only	Text and graphics	Text only	Text and graphics
GEM Desktop Publisher	45K	57K	41.7	43.7	72.0	93.0	4.3	23.7	3.16	43.8
The Office Publisher	61K	513K	36.9	46.9	25.4	37.3	9.4	14.4	4.77	21.1
PageMaker (Mac version)	343K	370K	8.8	10.3	2.2	3.0	5.9	6.1	3.00	11.6
PageMaker	361K	370K	11.0	14.3	1.8	1.9	4.8	5.9	2.73	12.5
Ventura Publisher	22K	165K	14.1	17.3	12.3	16.5	2.1	7.8	4.12	16.3

are not as extensive as the ones offered by *Ventura Publisher*, they are easier to use and should be adequate for most applications.

In its current incarnation, *PageMaker* remains one of the easiest page layout packages to learn and to use, while offering the same range of typographical controls as do more complex programs. Its intuitive menus make it easy for casual users to relearn the program quickly. Its graphics and layout features, pasteboard area, and flexible text-formatting capabilities make it a true designer's tool. However, its lack of style sheets and its inability to flow text from one page to another make its use tedious for long documents. But with all the support that *PageMaker* is receiving from hardware manufacturers—added to the momentum it has already gained after 3 years on the market—we can expect this product to be widely accepted and to continue evolving in response to the demands of the maturing market.

Ventura Publisher

In our last article on desktop publishing, *PC Magazine* named *Ventura Publisher*, Version 1.0, from Xerox Corp., the Editor's Choice. The latest release, Version 1.1, adds over 80 new features and eliminates some of the inconveniences, making this product more flexible than ever.

Ventura's latest offering includes a wide range of automated controls over text formatting, with options such as automatic numbering of pages, sections, footnotes, and figure captions. In addition, the new version has improved typographic controls, supports a wider range of sources for graphics and text, and can output to more printers at faster printing speeds. Though both versions are priced at $895, Xerox charges registered 1.0 owners who purchased the product prior to March 1, 1987, $100 for the new release ($35 if purchased after March 1).

If you're familiar with the GEM operating system, you'll feel comfortable with *Ventura Publisher*. The package runs under GEM and incorporates all of that environment's graphical conventions, including drop-down menus, dialog boxes, and a movable window with scroll bars. Although every menu command has a keyboard alternative, you need a mouse to draw graphics or position frames on a page.

Ventura allows you to work in a WYSIWYG view of the page in three views: actual size, reduced to fit the full page on the screen, or enlarged to a 200 percent magnification. Version 1.1 lets you format pages up to 11 by 17 inches for PostScript-compatible printers or 18 by 24 inches for typesetters. *Ventura Publisher* now accommodates a string of up to 128 chapters, up from 64 in Version 1.0, containing from 150 to 300 pages, or 500K bytes each (up from 150K bytes). The limit on the number of text and picture files and style sheet tags has also doubled, from 64 to 128.

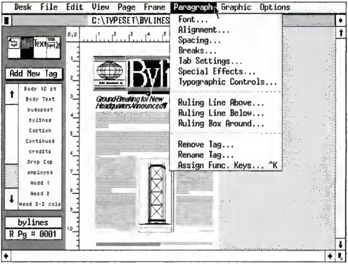
To create a page layout in *Ventura Publisher*, you draw rectangles, or "frames," on a page. You can then either fill each frame with a text or graphics file imported from another program or type text in directly. Each frame can be divided into columns that automatically affect the layout of the text in the frame. And you have the option of leaving blank space around the text or graphic in the frame. This is important when you want to wrap the text of an article or document around a frame that contains a graphic or a sidebar of related text.

To add graphics or other text to a page, you can place a new frame for those elements atop an existing one. Text in the original frame will then automatically wrap around the new frames (unless you turn the feature off). You can leave white space between the wrapped text and the new frame's contents by setting margins.

Version 1.1 of *Ventura Publisher* adds the ability to tie a frame to a text reference. This allows you to anchor a frame that contains a figure to the text that refers to it. When edits to the text force the figure reference to move from one page to another, the frame containing the figure will automatically move to the appropriate page.

Ventura Publisher's latest offering includes a wide range of automated controls over text formatting, with options such as automatic numbering of pages, sections, footnotes, and figure captions.

DOCUMENT MANAGEMENT A *Ventura* "document" is composed of many different disk files. Text and graphics, page layout information, the style sheet and the font width tables, for instance, are all stored as separate files. One advantage to this approach is that you can edit the graphics using a graphics package or edit the text using a word processing program, and the changes that are made in the separate files will be reflected in the *Ventura* document. Conversely, any edits that are made to the text directly through *Ventura*



You can define character and paragraph formatting throughout an entire document using style sheets you create with the menu above in Ventura Publisher. *You can use these style sheets in any document and mark text to change its type specifications or paragraph format.*

are automatically reflected in the separate text file.

On the other hand, this approach makes managing files for a large document a formidable task. The task is complicated by the fact that you cannot simply copy all related files from one disk drive to another: if you assemble your document from files on drive C:, for example, then copy all of the files into drive A: or D: *Ventura* will still look to drive C: when you open the document in drive A: or D:. The solution is to use a "save as" operation on each element from within the document, though this can be a time-consuming approach if your document is composed of many different files. Fortunately, *Ventura* allows you to create a single print file that you can copy to a floppy disk and transport from one machine to another easily, though you cannot edit this file directly.

Whether your text has been imported or typed into *Ventura*, it is automatically formatted in the typeface and paragraph format that you've defined in your style sheet for "body text," although settings for bold, underscore, and italic text will be preserved from supported word processors.

One of *Ventura*'s most powerful features is its ability to create style sheets, which allow you to define character and paragraph formatting that will apply throughout a document. Once a style sheet has been created and saved, you can use it in any number of documents. The package also gives you the option of marking text, which doesn't have to be contiguous, to change its type specifications or paragraph format.

EDITOR'S CHOICE

PC MAGAZINE FACT FILE

***Ventura Publisher*, Version 1.1**
Xerox Corp.
101 Continental Blvd.
El Segundo, CA 90245
(800) 822-8221
List Price: $895
Requires: 512K RAM (640K RAM recommended), 10-Mbyte hard disk, mouse, DOS 2.0 or later.

In Short: *Ventura* offers a wealth of controls and options, including flexible and comprehensive style sheets and the ability to edit text throughout the production cycle. However, it is more difficult to learn than any of the other packages. Not copy protected.

CIRCLE 646 ON READER SERVICE CARD

You can format text in any size up to 254 points (for printers that support that range) and choose from a wide selection of typefaces that come with *Ventura*. You can also customize the list of typefaces, sizes, and styles available by loading a "width table," which gives *Ventura* information about the width of each character in each font used in the document. This data determines how lines break throughout the text and is used for displaying the text on the screen.

Although the number of typefaces, styles, and sizes available at any one time will be determined by your printer, *Ventura* includes a number of downloadable fonts for the Hewlett-Packard Laserjet Plus. Version 1.1 eliminates 1.0's built-in limit of eight typefaces per document (or per width table). *Ventura* also lets you use Hewlett-Packard SoftFonts, Adobe PostScript fonts, and fonts from Bitstream. (Xerox has signed an agreement with Bitstream whereby owners of *Ventura Publisher* can buy Bitstream's Fontware library of typefaces at a discount.)

TYPOGRAPHIC FEATURES *Ventura*'s typographic features are very flexible. You can adjust line spacing, or "leading," in decimal increments of inches, points, or centimeters. Version 1.1 lets you adjust the position and thickness of underscores and strikethroughs. You can define the spacing between paragraphs and force headings to start at the top of the page or the column. An automatic widow and orphan control feature lets you define the minimum number of lines allowed when breaking a paragraph across a column or page.

Version 1.1 allows you to control the spacing in justified text by setting the size of the maximum, normal, and minimum space between words. You can adjust letterspacing on three different scales. Using the automatic kerning option, you can activate *Ventura*'s built-in formulas for bringing certain pairs of letters closer together. A letterspacing option reduces the visual impact of loose lines (lines with too much space added between words as part of the justification process) by adding space between letters in increments of hundredths of an "em" space (a horizontal measure that is equivalent to the vertical height or point size of the type). A tracking adjustments option lets you expand or contract selected text.

Ventura offers automatic page numbering. It will also automatically include a page number, the chapter number, and section name in a header or footer. *Ventura Publisher*'s built-in hyphenation dictionary supports English, French, Spanish, and Italian, allowing you to hyphenate two languages in the same document. You can even limit the number of lines that are hyphenated in a row.

Ventura's built-in graphics are also very flexible. The graphics mode allows you to draw lines, boxes, and circles anywhere on the page using standard click-and-drag techniques.

You can assign ruled lines above, below, or around text by making the lines a part of the frame definition or a part of the paragraph tag. For example, you can draw a box around a frame that holds either text or graphics, or you can create a ruled line above every heading by that part of the style sheet's definition for that heading. This last feature is especially convenient for keeping ruled lines with the headings when the text moves as a result of edits or format changes in the document.

Frames, paragraphs, and drawn boxes can be given a fill pattern or background through a menu selection. You can set the

Ventura's built-in graphics are very flexible. The program's graphics mode allows you to draw lines, boxes, and circles anywhere on the page using standard click-and-drag techniques.

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- EMULATES 9 POPULAR PRINTERS
- 300 DPI FULL PAGE GRAPHICS
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- 1280 x 960 RESOLUTION
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CIRCLE 504 ON READER SERVICE CARD

PC EDITOR'S CHOICE

- **PageMaker**
- **Ventura Publisher**

Our first choice for professionals (with the persistence and stamina to survive the learning curve) remains Ventura Publisher*—our first choice in Volume 6 Number 3 as well. The ability to include ruled lines and boxes as part of a style sheet specification, link a series of "chapters" and automatically renumber them, include figure captions and footnotes, control ruled line widths and leading in decimal increments, and edit text in a word processor* after it *has been placed in a* Ventura *document makes this a high-volume workhorse. However, we'd like to see an option that lets us format text* without *a style sheet, since complex documents can require an unmanageably long list of styles. Given the vast improvements of the current version, 1.1, over 1.0, we can expect* Ventura *to remain at the head of the pack.*

For those who want a simple and flexible package, we recommend PageMaker. *It supports a wide range of word processors and graphics packages and is by far the easiest package to learn and use. However, without a style sheet feature and the ability to flow more than one column or page at a time,* PageMaker *falls short of the other three products as a productivity aid.*

line width and space above or below the ruled lines in decimal increments. The ruled lines that were set up as a frame or tag setting had to be either frame-wide or column-wide in Version 1.0, but in Version 1.1 you can set custom line lengths.

You can import both bit-mapped images and object-oriented line art into *Ventura* from a variety of outside sources. You can scale imported graphics to any size by dragging a corner of the frame that holds them. Version 1.0 lets you crop (or trim the edges from) bit-mapped images, and Version 1.1 also lets you crop line art.

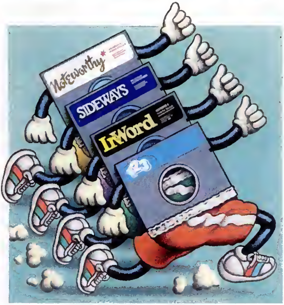
INSTALLATION AND SUPPORT *Ventura* runs on an IBM PC/XT/AT or compatible running DOS 2.1 or later, with a minimum 512K RAM, a 10-megabyte hard disk, mouse, and graphics card with monitor.

The full *Ventura Publisher* package with utilities comes on 11 disks and takes about 15 minutes to install. The installation process for Version 1.1 has been improved over 1.0 in that you can modify your configuration—change your mouse or monitor, for example—without having to reinstall the entire package.

Ventura comes with a short tutorial that takes you through basic features in a few hours. In our experience, the tutorial alone does not answer all questions that come up for new users. The 350-page manual is comprehensive and clear, but it is still a formidable task to learn all of *Ventura*'s features on your own. More than any other package reviewed here, *Ventura* invites hands-on training from an experienced user. Xerox offers four different two-day courses in *Ventura* (on specific documents such as brochures or newsletters), but so far these are offered in only 50 cities in the United States, and the classes in our region are booked well in advance.

Ventura Publisher offers more controls and options than any other package reviewed here. The only trade-off is that it is difficult to learn and master its many features, making it well suited for publishing departments with centralized page layout responsibilities but less suited for casual users with occasional publishing needs. Its flexible and comprehensive style sheet options, plus the ability to use a word processor to edit text throughout the production cycle, make *Ventura* the strongest desktop publishing package on the market under $1,000. PC

Diane Burns and S. Venit are owners of TechArt San Francisco, a graphic design and production shop that uses Macintoshes and IBM PCs to produce brochures, newsletters, and books for a variety of corporate clients. They are frequent contributors to PC Magazine.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You can format your documents with headers, footers, page numbers, tab stops, indents, hanging indents, as well as left, right, center and full justification.

Plus, you can print with bold, underlined and italic text, and mix typefonts and pitch to your heart's content. And since InWord takes full advantage of all your printer's features, you'll be able to create professional printouts of both your text and spreadsheets, whether you have a 9-pin dot-matrix, or a high performance printer like the HP LaserJet.

So it's up to you. You can limp along with a word processor that wouldn't know a spreadsheet if it tripped over it—or with one that's weak on features and wobbly on performance.

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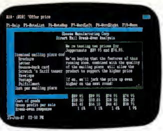

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Noteworthy even reminds you where you put your notes. Each time the cursor lands on an annotated cell, the note indicator lights up at the bottom of the screen.

At just $79.95, Noteworthy is a giant step forward in spreadsheet management. *(Requires 1-2-3 release 2 or Symphony)* CIRCLE 315 ON READER SERVICE CARD

Sideways. Making the world's favorite 1-2-3 printouts for four years running.

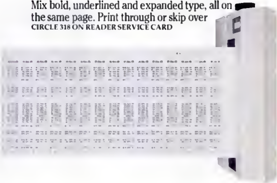
In the long run, there's no better way to get all the columns of your spreadsheet to print on one continuous page than with Sideways.® A fact that's helped make Sideways the most widely used printing utility of any kind in the history of personal computing.

Sideways turns text on its side as it prints. So no matter how many columns you put in your spreadsheet, you'll get a printout that goes the distance. Just highlight a range on your worksheet and go.

Plus, you'll be putting your best foot forward with printouts that really look great. Choose from nine different typefaces from "minuscule" to "mammoth". Mix bold, underlined and expanded type, all on the same page. Print through or skip over perforations. Add borders, change page size, adjust margins any way you like.

It's a fact. In the wide world of 1-2-3 spreadsheet printing, Sideways is number one. For just $69.95 a copy, why not get Sideways on your side? *(Works with all versions of 1-2-3 and Symphony, as well as other software)*

CIRCLE 318 ON READER SERVICE CARD



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_______ copies of Sideways at $69.95 each.

☐ My check is enclosed. Charge my ☐ Visa ☐ MasterCard

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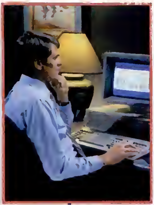
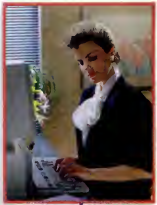
Print Master
lets people share printers



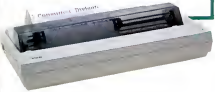


Get the most out of your expensive resources—your people, your computers and your printers—with Print Master by BayTech. Not only does it let your people and computers share all of your printers, its buffer keeps them working instead of waiting.

Easy to set up, easy to use

Initial setup is menu-prompted and allows you to configure Print Master to your application. You decide which ports are input and which are output. You also set such functions as baud rates, handshaking, timeout, how you select a printer, etc.

After setup, you simply cable Print Master between your computers and printers, and you're ready to go. BayTech's Memory Resident Program lets your PC users select printers via function keys that correspond to a menu window.



Print Master keeps everything running

All users can send data simultaneously to Print Master's dynamically allocated buffer, keeping your people and computers working. This first-in-first-out buffer also sends data to all printers simultaneously to keep them running at full capacity. The buffer size? A big 512K that's expandable to one megabyte.

Eleven models with serial and parallel

An advantage of Print Master is its flexibility: Any port can be a computer port or a printer port. Choose from eleven models with different combinations of serial and parallel ports. Print Master internally converts serial to parallel and vice versa on combination serial/parallel models. Six ports, $795. Eight ports, $895. Ten ports, $995.

Non-buffered models from $339. GSA pricing available.

Want details?

Contact your dealer or Bay Technical Associates for information about Print Master and BayTech's complete line of data communications products, proudly made in the U.S.A.

BayTech

Bay Technical Associates, Inc.
Data Communications Products Division
200 N. Second St., P.O. Box 387
Bay Saint Louis, Mississippi 39520
Telex 910-333-1618 BAYTECH
Phone 601-467-8231 or
800-523-2702

CIRCLE 214 ON READER SERVICE CARD

→ COVER STORY → DIANE BURNS AND S. VENIT

PageMaker on the Macintosh remains the de facto standard for desktop publishing features and output. Examine how close the newest PC products come to that standard.

GAINING ON *the* MAC

The whole reason for using a WYSIWYG page-layout package is to produce quality printed output. And, with the revision of old products and introduction of new ones, the overall quality of the output has gone up a notch since we tested page-layout packages last February (see "Special Report: Desktop Publishing," Volume 6 Number 3).

To let you see the output for yourself, we ran the products through all their tricks and paces in a typical application. We used each of them to produce a newsletter. So that you could see the change in quality of the packages, we used the same four-page newsletter, which we called "Bylines" (from the fictional Better Management Inc.) that we used last February for our testing; we changed just one photograph.

The newsletter uses one-, two-, and three-column formats separated by hairline rules; jumps text between pages; wraps copy around art; runs headers and footers on each page; has drop caps at the start of a story; and incorporates scanned pictures, a *1-2-3* .PIC file, and an image created in a drawing package.

We formatted the text for each article in the newsletter using *Microsoft Word*. For printing, we used the following Helvetica fonts: 24-point bold italic, 18-point bold italic, 10-point book, 10-point italic, 10-point bold italic, 9-point book, 9-point bold, 9-point italic, 7-point italic. Each document was printed on the Apple LaserWriter which, because it is a PostScript-based printer, has infinite control over fonts and type sizes.

Because *PageMaker* still sets the standard for desktop publishing, we used output from *PageMaker* on the Macintosh as the control in our tests. The other sample documents were made using *GEM Desktop Publisher*, *PageMaker* on the PC, *The Office Publisher*, and *Ventura Publisher*.

PAGEMAKER (MAC VERSION)

1. **The logo was drawn using *MacDraw*, where a screen pattern was applied to the lines of the globe.**

2. **We typed the Bylines title directly into *PageMaker;* it was manually kerned on-screen.**

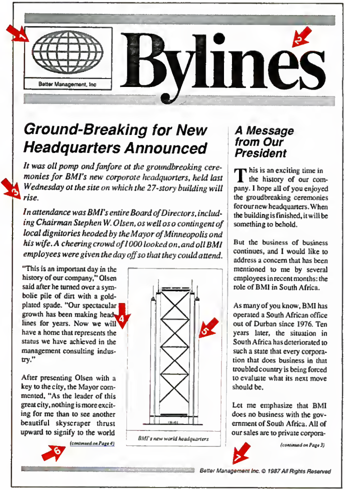
3. **We formatted the text font and size in *Microsoft Word;* when the file was imported, *PageMaker* maintained all the formatting. In fact, *PageMaker*, with its ability to retain indents, tabs, and typefaces for supported word processors, can import more formatting features than can any of the other packages reviewed.**

4. **Hyphenation is based on the Houghton-Mifflin dictionary.**

5. **This building was drawn using *Publisher's Paintbrush* (an upgrade of *PC Paintbrush*), then imported into and resized in *PageMaker*.**

6. **The "continued on Page x" references were typed in manually. None of the packages reviewed featured automatic continued lines.**

7. **We drew the gray bar with one of *PageMaker*'s built-in drawing tools on the master page; this caused the bar, as well as the footer text, to appear automatically on every page.**



Better Management, Inc

Bylines

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(continued on Page 4)

BMI's new world headquarters

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But the business of business continues, and I would like to address a concern that has been mentioned to me by several employees in recent months: the role of BMI in South Africa.

As many of you know, BMI has operated a South African office out of Durban since 1976. Ten years later, the situation in South Africa has deteriorated to such a state that every corporation that does business in that troubled country is being forced to evaluate what its next move should be.

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(continued on Page 3)

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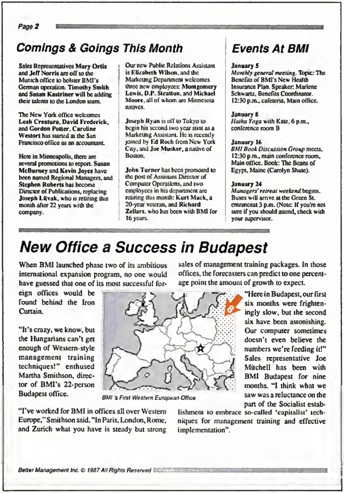

Page 2

Comings & Goings This Month

Sales Representatives **Mary Ortiz** and **Jeff Norris** are off to the Munich office to bolster BMI's German operation. **Timothy Smith** and **Susan Kastriner** will be adding their talents to the London team.

The New York office welcomes **Leah Creatura, David Frederick,** and **Gordon Potter. Caroline Westort** has started at the San Francisco office as an accountant.

Here in Minneapolis, there are several promotions to report. **Susan McBurney** and **Kevin Joyce** have been named Regional Managers, and **Stephen Roberts** has become Director of Publications, replacing **Joseph Litvak,** who is retiring this month after 22 years with the company.

Our new Public Relations Assistant is **Elizabeth Wilson,** and the Marketing Department welcomes three new employees: **Montgomery Lewis, D.P. Stratton,** and **Michael Moore,** all of whom are Minnesota natives.

Joseph Ryan is off to Tokyo to begin his second two year stint as a Marketing Assistant. He is recently joined by **Ed Roch** from New York City, and **Joe Musker,** a native of Boston.

John Turner has been promoted to the post of Assistant Director of Computer Operations, and two employees in his department are retiring this month: **Kurt Mack,** a 20-year veteran, and **Richard Zellars,** who has been with BMI for 16 years.

Events At BMI

January 5
Monthly general meeting. Topic: The Benefits of BMI's New Health Insurance Plan. Speaker: Marlene Schwartz, Benefits Coordinator. 12:30 p.m., cafeteria, Main office.

January 8
Hatha Yoga with Kate, 6 p.m., conference room B

January 16
BMI Book Discussion Group meets, 12:30 p.m., main conference room, Main office. Book: The Beans of Egypt, Maine (Carolyn Shute).

January 24
Managers' retreat weekend begins. Buses will arrive at the Green St. entranceat 3 p.m. (Note: If you're not sure if you should attend, check with your supervisor.

New Office a Success in Budapest

When BMI launched phase two of its ambitious international expansion program, no one would have guessed that one of its most successful foreign offices would be found behind the Iron Curtain.

"It's crazy, we know, but the Hungarians can't get enough of Western-style management training techniques!" enthused Martha Smithson, director of BMI's 22-person Budapest office.

BMI 's First Western European Office

"I've worked for BMI in offices all over Western Europe," Smithson said. "In Paris, London, Rome, and Zurich what you have is steady but strong sales of management training packages. In those offices, the forecasters can predict to one percentage point the amount of growth to expect.

"Here in Budapest, our first six months were frighteningly slow, but the second six have been astonishing. Our computer sometimes doesn't even believe the numbers we're feeding it!" Sales representative Joe Mitchell has been with BMI Budapest for nine months. "I think what we saw was a reluctance on the part of the Socialist establishment to embrace so-called 'capitalist' techniques for management training and effective implementation".

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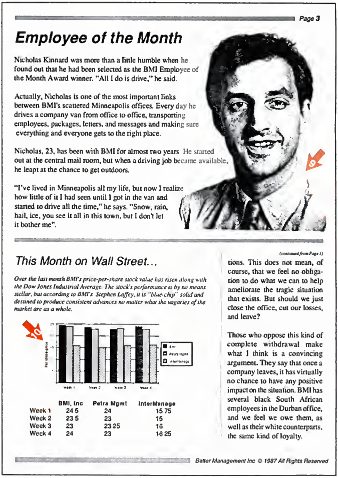
8. This map is from *Click Art Publications*, a disk file of predrawn artwork for *MacPaint* produced by T/Maker Co. in Mountain View, California. We added the star in *MacPaint* and cropped the image in *PageMaker*.

PAGEMAKER (MAC VERSION)

9. **This photographic image was scanned using a Microtek scanner with *VersaScan* software and saved in TIFF format.**

10. **This chart was generated in *Excel* and imported into *MacDraw*, where it was saved in the PICT format, then imported into *Page-Maker*.**



Page 3

Employee of the Month

Nicholas Kinnard was more than a little humble when he found out that he had been selected as the BMI Employee of the Month Award winner. "All I do is drive," he said.

Actually, Nicholas is one of the most important links between BMI's scattered Minneapolis offices. Every day he drives a company van from office to office, transporting employees, packages, letters, and messages and making sure everything and everyone gets to the right place.

Nicholas, 23, has been with BMI for almost two years. He started out at the central mail room, but when a driving job became available, he leapt at the chance to get outdoors.

"I've lived in Minneapolis all my life, but now I realize how little of it I had seen until I got in the van and started to drive all the time," he says. "Snow, rain, hail, ice, you see it all in this town, but I don't let it bother me".

This Month on Wall Street...

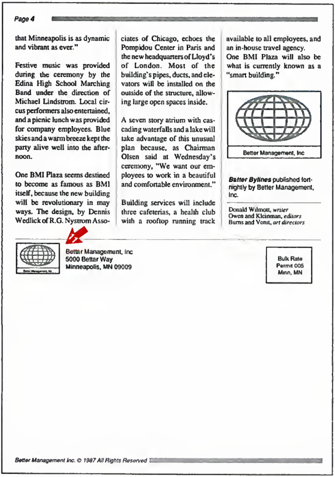
Over the last month BMI's price-per-share stock value has risen along with the Dow Jones Industrial Average. The stock's performance is by no means stellar, but according to BMI's Stephen Laffey, it is "blue-chip" solid and destined to produce consistent advances no matter what the vagaries of the market are as a whole.

	BMI, Inc	Petra Mgmt	InterManage
Week 1	24 5	24	15 75
Week 2	23 5	23	15
Week 3	23	23 25	16
Week 4	24	23	16 25

(continued from Page 1)

tions. This does not mean, of course, that we feel no obligation to do what we can to help ameliorate the tragic situation that exists. But should we just close the office, cut our losses, and leave?

Those who oppose this kind of complete withdrawal make what I think is a convincing argument. They say that once a company leaves, it has virtually no chance to have any positive impact on the situation. BMI has several black South African employees in the Durban office, and we feel we owe them, as well as their white counterparts, the same kind of loyalty.



Page 4

that Minneapolis is as dynamic and vibrant as ever."

Festive music was provided during the ceremony by the Edina High School Marching Band under the direction of Michael Lindstrom. Local circus performers also entertained, and a picnic lunch was provided for company employees. Blue skies and a warm breeze kept the party alive well into the afternoon.

One BMI Plaza seems destined to become as famous as BMI itself, because the new building will be revolutionary in may ways. The design, by Dennis Wedlick of R.G. Nystrom Associates of Chicago, echoes the Pompidou Center in Paris and the new headquarters of Lloyd's of London. Most of the building's pipes, ducts, and elevators will be installed on the outside of the structure, allowing large open spaces inside.

A seven story atrium with cascading waterfalls and a lake will take advantage of this unusual plan because, as Chairman Olsen said at Wednesday's ceremony, "We want our employees to work in a beautiful and comfortable environment."

Building services will include three cafeterias, a health club with a rooftop running track available to all employees, and an in-house travel agency. One BMI Plaza will also be what is currently known as a "smart building."

Better Management, Inc

Batter Bylines published fortnightly by Better Management, Inc.

Donald Wilmott, *writer*
Owen and Kleinman, *editors*
Burns and Venit, *art directors*

Bettar Management, Inc
5000 Bettar Way
Minneapolis, MN 09009

Bulk Rate
Permit 005
Minn, MN

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11. The ***MacDraw*** **logo reduces correctly, with no distortion of the text.**

Strokes Of Genius.

If you haven't been to Europe or taken a world tour lately, you may not have heard of AMSTRAD. So, let us introduce ourselves.

AMSTRAD is a British company that makes the best selling computer in Europe.* We even outsell IBM. And worldwide, over 2,000,000 AMSTRAD computers have been sold — not to mention all the AMSTRAD printers and word processors in use.

Now AMSTRAD is coming to America. And you'll soon see why AMSTRAD is making the competition very nervous.

Why buy your computer in expensive little pieces? With most computers, expanding capabilities means spending a fortune for add-ons. Not with AMSTRAD. Our computers come with additional ports *built-in.* That means no expensive brain surgery is required if you ever need to expand.

AMSTRAD computers also allow you to upgrade graphics capabilities — also without brain surgery. The PC1640 has monochrome (Hercules), CGA and EGA capabilities built into a single motherboard. So, to make your work look better, simply install a more sophisticated AMSTRAD high quality monitor.

Everything you need in two managable boxes. Everything. Naturally, AMSTRAD Computers are IBM compatible. However, we've also built in the boards necessary to run mouse-driven, windowing GEM® software that lets you create spectacular graphics. We even give you a mouse and all the software you'll need — lots of it.

Imagine. Virtually everything you need to start computing within minutes after you open the box.

Extraordinary printers, too. AMSTRAD gives you a choice of two brilliantly designed printers — the DMP 3000 and the DMP 4000. Both offer IBM compatibility and a list of standard features other printer manufacturers call options.

What if you don't need a computer? If you just want to express yourself, you'll love AMSTRAD's 9512 Word Processor. It's incredibly easy to use, comes with powerful built in software to perform a variety of tricks, a large, high-resolution monitor and a letter quality printer. To create a bestseller, all you need to add is a great plot.

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We may not become as famous as the Beatles, but . . . With more than 700 dealers in America already (and the number is growing fast), AMSTRAD is quickly becoming famous for putting high performance within reach of thousands of businesses and personal users.

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CIRCLE 303 ON READER SERVICE CARD

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*Source: International Data Corp

GEM DESKTOP PUBLISHER

1. The logo was drawn in *GEM Draw*, which has no command for applying a gray screen pattern to the lines of the globe, as required by our original specs.

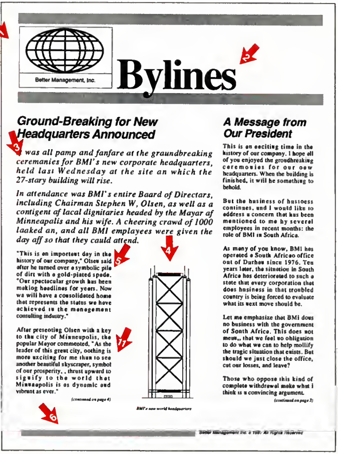
2. The Bylines title was typed in an ASCII text editor and imported into *GEM Desktop Publisher*, since the package doesn't allow you to type text in directly. The largest available PostScript font is 72 points; our specs required 127-point text.

3. *GEM Desktop Publisher* imports only straight ASCII files, so we were not able to do formatting in a word processor. Files were saved as text only, and we used the package's style sheets to apply the formatting.

4. We drew this building using *GEM Paint*, then resized it in *GEM Desktop Publisher*.

5. Our specifications required body copy to be in 12-point type. Since *GEM Desktop Publisher* doesn't offer that size, we substituted 10-point type instead.

6. *GEM Desktop Publisher* offers no graphics tools. However, you can give frames, into which you would normally place text or graphics, a screened background. This is how we produced all the gray bars in this sample.



Better Management, Inc.

Bylines

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(continued on page 4)

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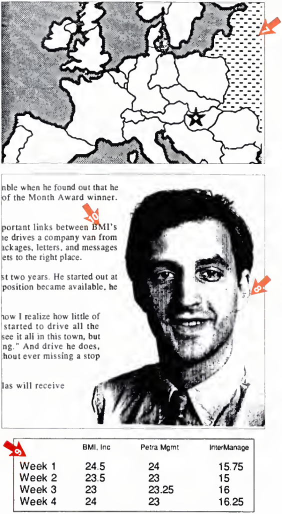

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	BMI, Inc	Petra Mgmt	InterManage
Week 1	24.5	24	15.75
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7. **This map is from *Click Art Publications*, a disk file of predrawn artwork for *MacPaint* sold by Software Publishing Corp. in Mountain View, California. We added the star in *MacPaint*, then scanned in the map with a Microtek scanner.**

8. **This image was scanned using a Microtek scanner with *EyeStar Plus* software and saved in the .IMG format. GEM does not support the TIFF format.**

9. ***GEM Desktop Publisher* does not directly support the importation of *1-2-3* .PIC files, so our page is blank where the chart should appear.**

10. **Text was wrapped around the scanned image by using several text frames having different widths.**

11. ***GEM Desktop Publisher* has no hyphenation capability.**

THE OFFICE PUBLISHER

1. *The Office Publisher* imports neither graphics nor text directly. Instead, you must convert both types of files before importing them. This logo, for instance, was drawn in *PC Paintbrush*, and converted using the Graphics Convert command.

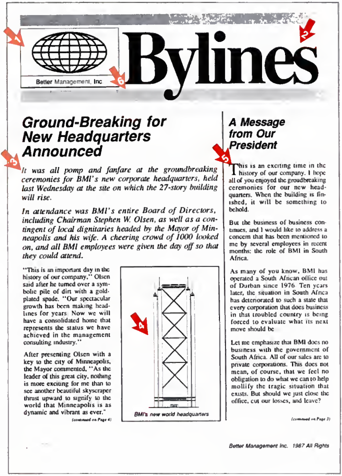
2. We typed the Bylines title directly into *The Office Publisher*.

3. Since we were unable to successfully convert *Microsoft Word* text files because of a bug in the product, we imported the text in ASCII form. *The Office Publisher* will import such formatting as italics and boldface from the word processor (when the bug is fixed), but other formatting is dictated by style sheets.

4. This building was drawn using *Publisher's Paintbrush*, imported, then resized in *The Office Publisher*.

5. Creating this initial drop cap was easy; we formatted it using a menu selection from the style sheet.

6. We drew the gray bar as a rectangle and filled it using a screen pattern.



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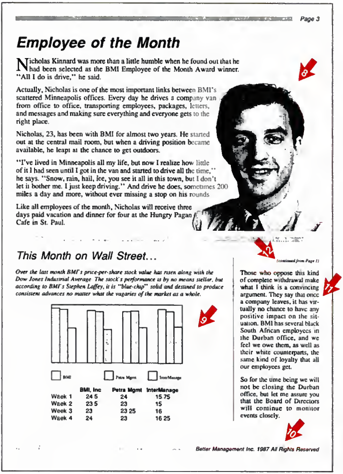

Page 3

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Actually, Nicholas is one of the most important links between BMI's scattered Minneapolis offices. Every day he drives a company van from office to office, transporting employees, packages, letters, and messages and making sure everything and everyone gets to the right place.

Nicholas, 23, has been with BMI for almost two years. He started out at the central mail room, but when a driving position became available, he leapt at the chance to get outdoors.

"I've lived in Minneapolis all my life, but now I realize how little of it I had seen until I got in the van and started to drive all the time," he says. "Snow, rain, hail, ice, you see it all in this town, but I don't let it bother me. I just keep driving." And drive he does, sometimes 200 miles a day and more, without ever missing a stop on his rounds

Like all employees of the month, Nicholas will receive three days paid vacation and dinner for four at the Hungry Pagan Cafe in St. Paul.

This Month on Wall Street...

Over the last month BMI's price-per-share stock value has risen along with the Dow Jones Industrial Average The stock's performance is by no means stellar, but according to BMI's Stephen Laffey, it is "blue-chip" solid and destined to produce consistent advances no matter what the vagaries of the market as a whole.

	BMI, Inc	Petra Mgmt	InterManage
Waek 1	24 5	24	15 75
Waek 2	23 5	23	15
Waek 3	23	23 25	16
Waek 4	24	23	16 25

(continued from Page 1)

Those who oppose this kind of complete withdrawal make what I think is a convincing argument. They say that once a company leaves, it has virtually no chance to have any positive impact on the situation. BMI has several black South African employees in the Durban office, and we feel we owe them, as well as their white counterparts, the same kind of loyalty that all our employees get.

So for the time being we will not be closing the Durban office, but let me assure you that the Board of Directors will continue to monitor events closely.

Better Management Inc. 1987 All Rights Reserved

7. This map is from *Click Art Publications*, a disk file of predrawn artwork for *MacPaint* produced by the Software Publishing Corp. in Mountain View, California. We added the star in *MacPaint*, then scanned the image into a *PC Paintbrush* file format. We had to convert into *The Office Publisher*'s own graphics format.

8. This image was scanned using a Microtek scanner, with its *EyeStar Plus*, a *Windows*-based software package, and saved in the .PCX, or *Paintbrush*, format. We used hard carriage returns at the end of each line to wrap text around the scanned photograph.

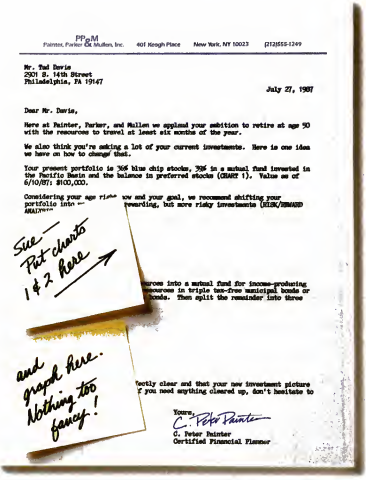
9. The .PIC files for the chart are like all other graphics files: *The Office Publisher* must convert them before it can use them.

10. To create the bar and footer at the bottom of the page, we put them on a template, which we then used for every page. *The Office Publisher* is unique in that it allows you to store a number of these templates.

11. *The Office Publisher* does hyphenation automatically, using a logic formula.

12. Continued lines were inserted manually.

While the DAISYWHEEL shoots blanks...



PP&M
Painter, Parker & Mullen, Inc. 401 Keogh Place New York, NY 10023 (212)555-1249

Mr. Tad Davis
2901 S. 14th Street
Philadelphia, PA 19147

July 27, 1987

Dear Mr. Davis,

Here at Painter, Parker, and Mullen we applaud your ambition to retire at age 50 with the resources to travel at least six months of the year.

We also think you're asking a lot of your current investments. Here is one idea we have on how to change that.

Your present portfolio is 36% blue chip stocks, 39% in a mutual fund invested in the Pacific Basin and the balance in preferred stocks (CHART 1). Value as of 6/10/87: $100,000.

Considering your age ri ow and your goal, we recommend shifting your portfolio into rewarding, but more risky investments (RISK/REWARD ANALY

Sue —
Put charts
1 & 2 here

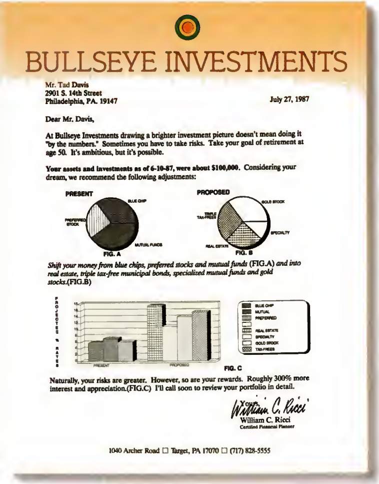
urces into a mutual fund for income-producing
esources in triple tax-free municipal bonds or
bonds. Then split the remainder into three

and
graph here.
Nothing too
fancy!

ectly clear and that your new investment picture
f you need anything cleared up, don't hesitate to

Yours,
C. Peter Painter
C. Peter Painter
Certified Financial Planner

...the OKIDATA LASER hits the mark.



BULLSEYE INVESTMENTS

Mr. Tad Davis
2901 S. 14th Street
Philadelphia, PA. 19147

July 27, 1987

Dear Mr. Davis,

At Bullseye Investments drawing a brighter investment picture doesn't mean doing it "by the numbers." Sometimes you have to take risks. Take your goal of retirement at age 50. It's ambitious, but it's possible.

Your assets and investments as of 6-10-87, were about $100,000. Considering your dream, we recommend the following adjustments:

Shift your money from blue chips, preferred stocks and mutual funds (FIG.A) *and into real estate, triple tax-free municipal bonds, specialized mutual funds and gold stocks.*(FIG.B)

Naturally, your risks are greater. However, so are your rewards. Roughly 300% more interest and appreciation.(FIG.C) I'll call soon to review your portfolio in detail.

Yours,
William C. Ricci
William C. Ricci
Certified Financial Planner

1040 Archer Road ☐ Target, PA 17070 ☐ (717) 828-5555

With a daisywheel you waste a lot of time plugging the holes in your ideas.

But with the new LASERLINE™6 from OKIDATA you can grab your reader's attention right away.

Make your letters more effective by using graphics. Call attention to your hot topics with 15 built-in type fonts. And add emphasis to your most important ideas with underlining, boldfacing and italicizing.

Thanks to the LaserControl™ disc you get with it, you can do it all using software that's probably sitting next to your PC right now.

The OKIDATA LASER is compatible with LaserJet® and LaserJet Plus® software. And it's very affordable. You can own it for about what you'd pay for a good daisywheel. Get the three-user module and you've got economy no daisywheel can match.

So see your OKIDATA dealer today. Or call 1-800-OKIDATA, Ext. 22, for the name of the dealer nearest you.

Stop shooting blanks and start hitting the mark with an OKIDATA LASER.

OKIDATA®
an OKI AMERICA company
We put business on paper.

CIRCLE 197 ON READER SERVICE CARD

PAGEMAKER (PC VERSION)

1. The logo was drawn in *Windows Draw*, which has no command for applying a gray screen pattern to the lines of the globe, as required by our original specs. The text in our logo was typed into *PageMaker* directly, since *PageMaker* distorts text typed into *Windows Draw*.

2. The Bylines title was typed directly into *PageMaker* and manually kerned on-screen.

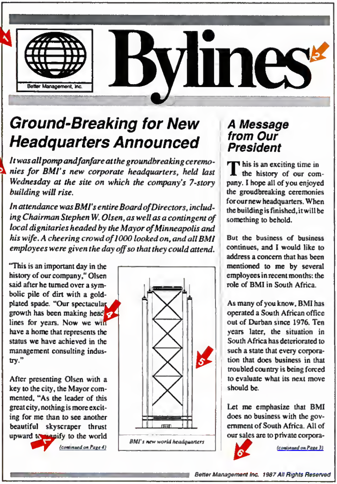
3. We used *Microsoft Word* to format the text font and size. When the file was imported, *PageMaker* retained all the formatting.

4. Hyphenation is based on the Houghton-Mifflin dictionary.

5. This building was drawn using *Publisher's Paintbrush*, then imported into and resized in *PageMaker*.

6. We typed in the "continued on Page x" references at each occurrence.

7. As in the Macintosh version, we drew the gray bar with a graphics tool on *PageMaker*'s master page. This caused the bar, as well as the footer text, to appear automatically on every page.



Better Management, Inc.

Bylines

Ground-Breaking for New Headquarters Announced

It was all pomp and fanfare at the groundbreaking ceremonies for BMI's new corporate headquarters, held last Wednesday at the site on which the company's 7-story building will rise.

In attendance was BMI's entire Board of Directors, including Chairman Stephen W. Olsen, as well as a contingent of local dignitaries headed by the Mayor of Minneapolis and his wife. A cheering crowd of 1000 looked on, and all BMI employees were given the day off so that they could attend.

"This is an important day in the history of our company," Olsen said after he turned over a symbolic pile of dirt with a gold-plated spade. "Our spectacular growth has been making headlines for years. Now we will have a home that represents the status we have achieved in the management consulting industry."

After presenting Olsen with a key to the city, the Mayor commented, "As the leader of this great city, nothing is more exciting for me than to see another beautiful skyscraper thrust upward to magnify to the world

(continued on Page 4)

BMI's new world headquarters

A Message from Our President

This is an exciting time in the history of our company. I hope all of you enjoyed the groudbreaking ceremonies for our new headquarters. When the building is finished, it will be something to behold.

But the business of business continues, and I would like to address a concern that has been mentioned to me by several employees in recent months: the role of BMI in South Africa.

As many of you know, BMI has operated a South African office out of Durban since 1976. Ten years later, the situation in South Africa has deteriorated to such a state that every corporation that does business in that troubled country is being forced to evaluate what its next move should be.

Let me emphasize that BMI does no business with the government of South Africa. All of our sales are to private corpora-

(continued on Page 3)

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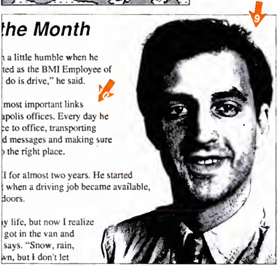

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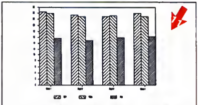


	BMI, Inc	Petra Mgmt	InterManage
Week 1	24.5	24	15.75
Week 2	23.5	23	15
Week 3	23	23.25	16
Week 4	24	23	16.25

8. This map, like the one from the Mac version, is from *Click Art Publications*, a disk file of predrawn artwork for *MacPaint* produced by Software Publishing Corp. in Mountain View, California. We added the star in *MacPaint*, transferred the file to the IBM PC, and cropped the image in *PageMaker*.

9. This photographic image was scanned using a Microtek scanner and *EyeStar Plus*, a *Windows*-based scanning software package. It was saved in TIFF format.

10. Text was wrapped around the scanned image by inserting hard carriage returns at the end of each line. While this effect looks good, it would make editing difficult.

11. This chart was generated in *1-2-3* and imported directly into *PageMaker*.

12. The logo, created using *Windows Draw*, reduces correctly, but the text is distorted.

The difference is compatibility.

Introducing the first software system that solves all three compatibility problems: Between applications. Between PCs. And even between brands of software.

We call it Smart 3.1
You'll call it a lifesaver.

Between Applications

Smart includes the full range of productivity applications your office needs: Word processing, data base management, spreadsheet analysis, business graphics, and communications.

All perfectly integrated for easy transfer of data from one application to the next.

And only Smart lets you create custom programs that actually jump between applications. So, for instance, a single keystroke can transform a worksheet into a 3-D pie chart, paste the chart into a document, and send the document via modem to the home office.

Remember

Smart's "REMEMBER" command lets non-programmers create custom programs.

ber Send Tex

Smart's "SEND" command makes it easy to move data between applications.

Waiting for record lock

Smart automatically protects your data in multiuser environments.

Between Workstations

Every Smart application includes a fully automatic File or Record-Locking scheme for shared data. So right out of the box, Smart can be used either on a single user PC or on a LAN workstation.

Between DOS and UNIX

There are even versions of Smart for multiuser UNIX® and XENIX® systems; all 100% file compatible with the DOS version of Smart.

Which, according to Information Week, makes Smart "the first to provide DOS-UNIX-LAN connectivity without sacrificing power and features."

Between Software Brands

Old software can be replaced, but old data can't. So you'll be pleased to learn that Smart is fully compatible with files already created with programs like Lotus 1-2-3 and dBase III Plus.

Smart also reads and writes ASCII, SYLK, DIF, and DCA.

Oh by the way, there's something else Smart is perfectly compatible with: You. Fact is, nearly every top computing magazine has praised Smart for its ease of use, on-line help, extensive tutorials, and clearly written manuals.

But why not see for yourself?

Just return the attached card, or call toll-free (800) 331-1763 (in Kansas, Alaska or Canada call (913) 492-3800) and we'll rush you a free Smart demo disk and information kit.

SmartWare®
from Innovative Software

VENTURA PUBLISHER

1. **This logo was drawn in *GEM Draw*, which has no command for applying a gray screen pattern to the lines of the globe, as required by our original specs.**

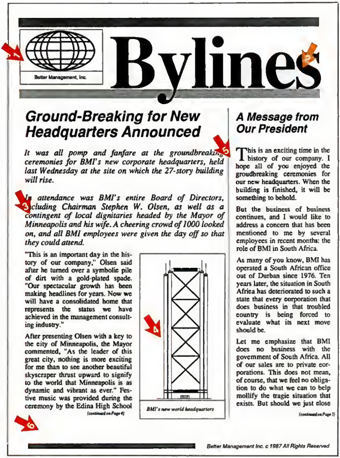
2. **We typed the Bylines title directly into *Ventura Publisher*.**

3. **We formatted text size, font, and type style (bold, italic) in *Microsoft Word*, but when we imported the file, only the bold and italics were retained. We used *Ventura*'s style sheets to format other type specs, such as font and size.**

4. **This building was drawn using *Publisher's Paintbrush*, then resized in *Ventura Publisher*.**

5. **The oversized dropped-initial cap was formatted using a single Special Effects command.**

6. **We drew the gray bar on *Ventura*'s "underlying," or master, page, which caused the bar to appear automatically on every page.**



Better Management, Inc.

Bylines

Ground-Breaking for New Headquarters Announced

It was all pomp and fanfare at the groundbreaking ceremonies for BMI's new corporate headquarters, held last Wednesday at the site on which the 27-story building will rise.

In attendance was BMI's entire Board of Directors, including Chairman Stephen W. Olsen, as well as a contingent of local dignitaries headed by the Mayor of Minneapolis and his wife. A cheering crowd of 1000 looked on, and all BMI employees were given the day off so that they could attend.

"This is an important day in the history of our company," Olsen said after he turned over a symbolic pile of dirt with a gold-plated spade. "Our spectacular growth has been making headlines for years. Now we will have a consolidated home that represents the status we have achieved in the management consulting industry."

After presenting Olsen with a key to the city of Minneapolis, the Mayor commented, "As the leader of this great city, nothing is more exciting for me than to see another beautiful skyscraper thrust upward to signify to the world that Minneapolis is as dynamic and vibrant as ever." Festive music was provided during the ceremony by the Edina High School

(continued on Page 4)

BMI's new world headquarters

A Message from Our President

This is an exciting time in the history of our company. I hope all of you enjoyed the groudbreaking ceremonies for our new headquarters. When the building is finished, it will be something to behold.

But the business of business continues, and I would like to address a concern that has been mentioned to me by several employees in recent months: the role of BMI in South Africa.

As many of you know, BMI has operated a South African office out of Durban since 1976. Ten years later, the situation in South Africa has deteriorated to such a state that every corporation that does business in that troubled country is being forced to evaluate what its next move should be.

Let me emphasize that BMI does no business with the government of South Africa. All of our sales are to private corporations. This does not mean, of course, that we feel no obligation to do what we can to help mollify the tragic situation that exists. But should we just close

(continued on Page 3)

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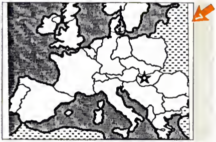

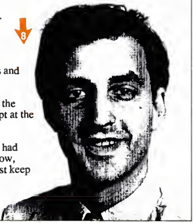

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Month Award winner.

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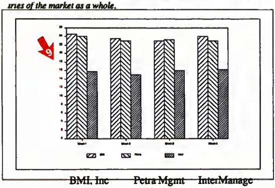
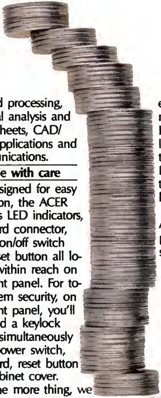


7. **This map comes from *Click Art Publications*, a disk file of predrawn artwork for *MacPaint* produced by Software Publishing Corp. in Mountain View, California. We added the star in *MacPaint*, then scanned the image into a *PC Paintbrush* file format.**

8. **We scanned this image using a Microtek scanner with *EyeStar Plus* software and saved it in a .PCX format. To do the text wrapping, we placed boxes over the graphics image, which forced the text away from the image.**

9. **This chart was generated in *1-2-3* and imported directly into *Ventura*.**

SMALL STAKES



When it's a choice between affordability, capability and reliability, logic dictates the best deal – the ACER 910 personal computer

You're looking for a personal computer – one to cope with your ever increasing demands? Perhaps finding one to suit that tight budget is proving a problem?

Well, in terms of real value for money the ACER 910 personal computer is it – no other machine comes close.

Faster than you can say IBM

At 10MHz, the ACER 910 can run your programs 25% faster than the industry standard AT. This power can also be switched down to 6MHz via keyboard or software for the few applications that need to operate under 10 MHz.

With its superior speed, and true-blue compatibility, the ACER 910 is a tireless thoroughbred when it comes to word processing, financial analysis and spreadsheets, CAD/CAM applications and communications.

Made with care

Designed for easy operation, the ACER 910 has LED indicators, keyboard connector, power on/off switch and reset button all located within reach on the front panel. For total system security, on the front panel, you'll also find a keylock which simultaneously locks power switch, keyboard, reset button and cabinet cover.

One more thing, we guarantee after-sales service through our worldwide distribution network, no matter where you are. And that means a great deal.

From home computers to super-micros – we have the PC for you.

Success breeds success

Our commitment to research and development has enabled us to build better, more affordable machines. From home computers like the ACER 500 and the world's fastest 8088 PC – the ACER 710 to the revolutionary 80386-based ACER 1100.

So check out the ACER 910. You'd be surprised what big returns such small stakes bring.

BIG DEAL

Technical Specifications

ACER 910B CPU 80286, 6/10MHz, switchable. Socket for 80287 math coprocessor, RAM 512KB, expandable to 1MB. 1FDD, 1.2MB. Microsoft® MS-DOS® 3.2.

ACER 910E As 910B plus 1WDD, 40MB, 28ms.

Microsoft MS-DOS is a registered trademark of Microsoft Corporation. IBM and PC-AT is a registered trademark of International Business Machines Corporation

Acer Technologies Corporation
401 Charcot Avenue, San Jose, CA 95131.
Tel: (408) 922-0333. Fax: (408) 922-0176.
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Acer

CIRCLE 218 ON READER SERVICE CARD

DIANE BURNS AND S. VENIT

Surging interest in desktop publishing has led vendors to identify their products by that term. While code-based programs are true alternatives to page-layout packages, some low-end programs are pretenders.

DESKTOP PUBLISHING: IF THE TERM FITS...

"Desktop publishing" is a catchall phrase. And the recent surge of interest in the topic has meant that more vendors are stretching it to catch more products than ever.

Take Prosoft's *Fontasy*. This product lets you create fonts on a dot matrix or laser printer and integrate text and graphics. The vendor indicates that you can use this program to make your daughter's wedding invitation. Fat chance.

You'll find lots of similar low-end packages that are best suited to producing only one-page flyers. These tend to be code interpreters that allow you to merge text with graphics files during the printing process or "display type" packages that offer bit-mapped type styles for dot matrix printers or low-resolution printing on a laser printer.

On the other hand, code-based packages are legitimate alternatives to

WYSIWYG packages. Such packages predate all of the WYSIWYG packages by 2 to 3 years. They offer more typographical controls than WYSIWYG systems and are often compatible with a wide range of high-end typesetting equipment. In addition, code-based packages allow you to do most of the coding using any word processor. These packages often offer useful full-screen preview capabilities—though you usually cannot edit in preview mode—and allow you to include graphics from other programs by embedding codes that reference outside files, though you usually cannot see the graphics, even with the preview feature.

These packages range in price from $700 for packages designed primarily for output to laser printers to more than $7,000 for packages such as *MagnaType* and *Superpage II* that are designed for output to typesetting equipment.

Code-based packages are preferable to WYSIWYG for a number of applications. For example, there has been a trend over the last 5 to 6 years toward making PCs compatible with phototypesetting terminals. Some of these code-based packages have evolved specifically for use by departments and service companies that already have an investment in a particular brand or model of typesetting equipment and want to add PCs to their systems as low-cost alternatives to expensive typesetting terminals. These packages can also be used on PCs at remote sites to prepare text that can be telecommunicated to the typesetter.

There are other advantages to using embedded codes to format a document. Hardware requirements are usually less than what they are for WYSIWYG page-layout packages. Because the screen doesn't have to be displayed in a graphics mode, code-based packages perform more quickly than their WYSIWYG counterparts.

The trade-off, of course, is that controlling the final appearance of the pages in a document is ultimately more difficult because you cannot see how the page will look until you print it. Some of these packages have a noneditable preview screen, but it can take up to 1 minute for the screen to draw each page in these previews. With systems that don't let you preview the page, you must print the page several times during the production phase, and even the most experienced typesetters find that it is easy to make a mistake in coding.

> Code-based packages offer more typographical controls than WYSIWYG systems and are often compatible with a wide range of high-end typesetting equipment.

One of these low-end or code-based packages might better suit your needs than the WYSIWYG packages reviewed here. Therefore, we include descriptions of some commonly available low-end and code-based packages. The descriptions are grouped in these two categories, respectively, and arranged in alphabetical order by product name.

LOW-END PACKAGES

Fancy Font

Fancy Font, by SoftCraft, is a $180 application for formatting and printing text and graphics to the HP Laserjet and a variety of dot matrix printers. Using the application PFONT, you open an existing word processing file or type directly into *Fancy Font*. By inserting bracket codes in the text, you can exercise a great deal of control over the final appearance of the page, including printing in multiple columns. You can also use *Fancy Font* to import graphics from *PC Paintbrush* or images in the tagged-image file format (TIFF).

LaserControl

LaserControl, Version 2.2, published by Insight Development Corp., is a $150 printer utility that serves as a printer driver for applications that have no driver for the Hewlett-Packard Laserjet. This program works with any PC application that already prints to a Diablo 630, Epson MX-80, IBM Graphics Printer, Qume Print 5, and NEC 3550, 5510, or 7710. *LaserControl* can function as a pop-up accessory or as a standalone applications program. The program works by taking the output of your word processing program, and translating it into escape codes understood by the HP. While the package allows you to select from various cartridges through the *LaserControl* menu, you can print only one font per document. You can print graphics by setting the HP to emulate an Epson printer, but in order to merge text and graphics you must run the same page through the printer twice: once for the text and once for the graphics.

LaserWare

This memory-resident utility program, which sells for $99.95, allows a variety of MS-DOS applications to take advantage of the HP Laserjet's text and graphics functions. By inserting bracket codes as text in your word processor, SWFTE International's *LaserWare* lets you format margins, line spacing, tabs, and other common formats. For example, the code [lL1.50] indicates an inch-and-a-half left margin. You can also insert bracket codes to print lines, boxes, and shade patterns, as well as external graphics files that have been output to disk and are in Epson- or Laserjet-compatible formats. To create custom fonts, you can use *Glyphic*, an optional font-generation package that creates outline fonts for use with *LaserWare* and other programs that support downloadable fonts.

NewsMaster

The $99.95 *NewsMaster*, from Unison World, is a simple, WYSIWYG page-layout package designed to work with dot matrix printers. It also works with the Hewlett-Packard Laserjet in an Epson-emulation mode. *NewsMaster* allows you to create multiple column layouts, import ASCII text files, and choose graphics from one of the four libraries offered by Unison World. The package also supports its own custom font list.

Introducing

CADKEY® 3

REAL WORLD DESIGN

Tools, Not Toys.

CADKEY quickly became the world's leading PC-based mechanical engineering system, with more than 25,000 installations, by pioneering the concept of a fully-integrated 2D-Drafting and 3D-Design system. We gave engineers real design tools, not toys. After all, the real world is three dimensional, not flat.

Real-World Solutions.

Now CADKEY 3 brings more real-world solutions to the PC by integrating all of the *useful* functions of surface-modeling, programmability, macro and tablet customization, and much more...

CADKEY 3 is a design toolbox stuffed with features:

- A Fully Programmable 3D Design Language (CADL 3.0)
- Wireframe and Surface Modeling and Editing
- User-Definable Macros and On-Line Calculator
- Customizable-Tablet Templates
- ANSI and ISO Drafting with Ordinate-Dimensioning
- A 3-D IGES Translator
- FEA and Multi-Axis NC Integration
- Family-of-Parts Creation
- Bill-of-Materials Generation
- Technical Publishing Links
- Compatibility with All Popular Hardware
- A Complete Training and Support Network
- World-Wide Dealer Coverage

...And that's just for starters... so how about bringing us *your* real world problem *today*? Call us now at **203-647-0220.**

CADKEY 3
Power... Performance... Price

CADKEY, A division of Micro Control Systems, 27 Hartford Turnpike, Vernon, CT 06066 (203) 647-0220 TELEX: 5106007223
CADKEY is a registered trademark of Micro Control Systems, Inc.

CIRCLE 165 ON READER SERVICE CARD

FACT FILE

LOW-END PACKAGES

Fancy Font,
Version 3.0
SoftCraft Inc.
16 N. Carroll St.
Madison, WI 53703
(800) 351-0500 (outside Wis.)
(608) 257-3300
List Price: $180
Requires: 256K RAM, two disk drives, DOS 2.0 or later.
Not copy protected.

CIRCLE **663** ON READER SERVICE CARD

LaserControl,
Version 2.2
Insight Development Corp.
1024 Country Club Dr.
Moraga, CA 94556
(415) 376-9451
List Price: $150
Requires: 128K RAM, one disk drive, DOS 2.0 or later.
Not copy protected.

CIRCLE **661** ON READER SERVICE CARD

LaserWare,
Version 1.22
SWFTE International Ltd.
P.O. Box 219
Rockland, DE 19732
(800) 237-9383
(302) 658-1123
List Price: $99.95
Requires: 45K RAM, one disk drive, DOS 2.0 or later.
Not copy protected.

CIRCLE **659** ON READER SERVICE CARD

NewsMaster,
Version 1.5
Unison World
2150 Shattuck Ave., #902
Berkeley, CA 94704
(415) 848-6666
List Price: $99.95
Requires: 256K RAM, two disk drives, DOS 2.0 or later.
Not copy protected.

CIRCLE **657** ON READER SERVICE CARD

PFS:First Publisher
Software Publishing Corp.
1901 Landings Dr.
Mountain View, CA 94039-72t0
(415) 962-8910
List Price: $129
Requires: 512K RAM, two disk drives, DOS 2.0 or later.
Not copy protected.

CIRCLE **656** ON READER SERVICE CARD

PowerText Formatter
Beaman Porter Inc.
417 Halstead Ave.
Harrison, NY 10528
(800) 431-0007 (outside N.Y.)
(914) 835-3156
(914) 835-3010
List Price: $149.95
Requires: 384K RAM, two disk drives, DOS 2.0 or later.
Not copy protected.

CIRCLE **655** ON READER SERVICE CARD

***Printrix*, Version 2.45**
Data Transforms Inc.
616 Washington St.
Denver, CO 80203
(303) 832-1501
List Price: $165
Requires: 256K RAM, one disk drive (hard disk recommended), DOS 2.0 or later.
Not copy protected.

CIRCLE **654** ON READER SERVICE CARD

***Fontrix*, Version 2.85**
Data Transforms Inc.
616 Washington St.
Denver, CO 80203
(303) 832-150t
List Price: $155
Requires: 512K RAM, one disk drive (hard disk recommended), DOS 2.0 or later.
Not copy protected.

CIRCLE **662** ON READER SERVICE CARD

PFS:First Publisher

PFS:First Publisher, produced by Software Publishing Corp., is really just a speedier version of *PFS:ClickArt Personal Publisher* (reviewed in "Muscling In on the Mac: PC-Based Page Composition," *PC Magazine*, Volume 6 Number 3). While it sports the WYSIWYG interface of mainstream desktop publishing packages, *PFS:First Publisher* offers limited typographic controls and supports only bit-mapped graphics. *PFS:First Publisher* offers other improvements to the original *ClickArt* package besides a 3× speed enhancement: you can now import ASCII files up to 100 pages long, and there is additional support for some of the most popular graphics programs, including *Windows Paint*, *PC Paintbrush*, and *MacPaint*. The package supports a number of dot matrix printers as well as the HP Laserjet and Apple LaserWriter.

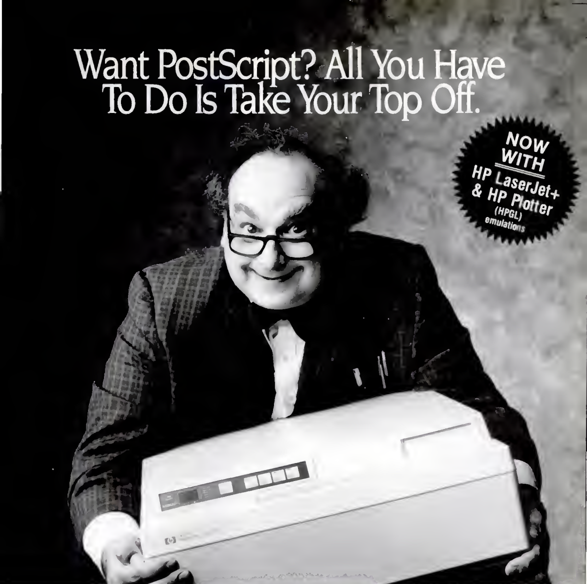
PowerText Formatter

The $149.95 *PowerText Formatter*, from Beaman Porter, uses predefined style sheets in conjunction with codes embedded in word processing files to produce page output to dot matrix printers or the Hewlett-Packard Laserjet. *PowerText Formatter* can read any ASCII file, as well as files created in *PFS:Write*, *Writing Assistant*, *WordStar*, *XyWrite*, and *Volkswriter*. After saving your word processing file to disk, you run *PowerText Formatter* and the appropriate Format file, which contains information on margins, headers, and styles, is read with the word processing file. You can embed codes for drawing simple graphic objects, such as lines and boxes. To incorporate bit-mapped graphics, you must use an optional program, the $99 *Inset* package from Inset Systems, Danbury, Conn., which is a screen capture program that also has graphics creation and editing capabilities.

Printrix
Fontrix

Printrix, from Data Transforms, is a $165 menu-driven program for formatting boiler-plate documents with predefined headers, footers, margins, and so on. To use

Want PostScript? All You Have To Do Is Take Your Top Off.



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this package, you embed *Printrix* formatting codes in the text created with a word processing program. To print graphics and text together, you can merge graphics that have been created with *Fontrix*, also by Data Transforms, or in BASICA (programming language) into your document. You can use the $155 *Fontrix* alone to create pages that incorporate text and graphics and preview them on the screen. *Printrix* and *Fontrix* work with the Quadram QuadLaser, the Cordata LP300X, and Kyocera models F-101 and F-2010, and other laser printers with a Jlaser board.

CODE-BASED PACKAGES

Crystal Publishing System

Crystal Publishing System is the name given to Syntactics Corp.'s MS-DOS and UNIX-based word processor, the $495 *CrystalWriter Plus*, and typesetting program, the $495 *Crystal TypeSet*. (You can purchase both programs together for $895. You can benefit from the added word processing features that are available with *CrystalWriter* and use the *TypeSet* package, running in the background, to compose formatted pages that print to the Hewlett-Packard Laserjet. The package lets you specify fonts, leading, kerning, and hyphenation parameters. A PostScript-compatible version of the program is due soon.

Crystal Publishing System's main strength is formatting text, but it does import graphic images created in other programs, such as *MacPaint*. The program also lets you draw simple rule lines and boxes around text.

DeskSet Desiqn Edition DeskSet PS Edition

DeskSet Desiqn Edition is the Compugraphics typesetter version of G.O. Graphics' *DeskSet PS Edition* typesetting program. *DeskSet PS Edition* ($995) and *DeskSet Desiqn Edition* ($1,195) are similar in functionality; however, *DeskSet PS Edition* supports PostScript printers, including the Linotype PostScript typesetter; *DeskSet Desiqn Edition* was designed especially for Compugraphics' phototypesetters.

> *MagnaType* offers extremely sophisticated typographic controls, as well as true vertical justification, vertical alignment, and widow and orphan control.

DeskSet uses Compugraphics typesetting codes, such as <PS18, LL20> for indicating point size (18 point in this example, and line leading 20 point). The *Desiqn Edition* supports the full Compugraphics type library. Fonts can be set in half-point increments from 5 to 72 points and type can be set in reverse (white type on black background). Other features include hyphenation, kerning, widow and orphan control, and the ability to preview the page in a noneditable WYSIWYG mode before printing. The program supports graphics from programs such as *PC Paintbrush* and *Dr. Halo*, as well as readings from Microtek and Datacopy scanners. The program can typeset graphics on Compugraphic 8000 and 8400 typesetters by using Compugraphics' new Graphic Elements Font.

LaserScript

Command Technology Corp. developed the $695 *LaserScript* out of its need to create the documentation for the company's SPF/PC mainframe text editor. *LaserScript* was designed especially for use with the HP Laserjet, although a *PostScript* version of the program is due soon. *LaserScript* uses embedded codes and has many features helpful for the preparation of long documents, including automatic table-of-contents generation, automatic multilevel index generation, and automatic cross-reference generation.

You can also use it to link graphics with text, such as "See Figure 2.4," so that even when you edit the text, the figure stays with the associated text reference. Graphics packages supported include *Publisher's Paintbrush*, *AutoCAD*, *In*a*Vision*, and *Windows Draw*. Lotus's *1-2-3* files can be imported, but only via *Windows Draw*.

MagnaType

Typesetting front ends are expensive, and the $8,500 *MagnaType* on the PC offers one of the most important PC alternatives to multiple typesetting terminals, which can easily cost upward of $20,000 each. This is not a desktop publishing package; it is a typesetting front end, originally introduced in 1986 by Magna Computer Systems to emulate CCI typesetting terminals that connect to a mini computer. While *MagnaType* will print to any PostScript laser printer, you need a phototypesetter to tap *MagnaType*'s real power and justify the cost. *MagnaType* supports multiple terminals on a network, and the price decreases dramatically with multiple purchases.

Like most typesetting systems, *MagnaType* uses a system of short codes input by you which are, in turn, translated into the more-complex strings understood by the typesetter. *MagnaType* offers extremely sophisticated typographic controls, as well as true vertical justification, vertical alignment, and widow and orphan control.

The program lets you generate rule lines and boxes around text, and the PostScript version lets you use graphics created with *Publisher's Paintbrush*. It also supports such scanners as Microtek and Datacopy.

ScenicWriter

PC Magazine first looked at this product in December of 1985 ("Words into Type: Meeting the Corporate Challenge," *PC Magazine*, Volume 4 Number 25). At $695, *ScenicWriter*, from ScenicSoft, is a powerful text formatter that lets you insert codes to format text for output to laser printers and phototypesetters. The program uses embedded dot and backslash commands to control the appearance of the document, including margins, text alignment, and bulleted lists. Format com-

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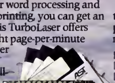

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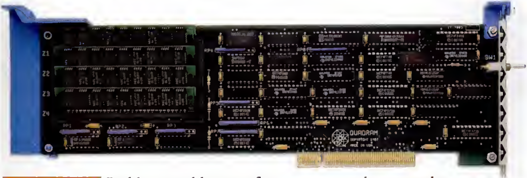

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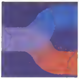

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PC FACT FILE

CODE-BASED PACKAGES

Crystal Publishing System
Syntactics Corp.
4655 Old Ironsides Dr., #400
Santa Clara, CA 95054
(408) 727-6400
List Price: $895; $495 for *CrystalWriter Plus* only; $495 for *Crystal Typeset* only.
Requires: 512K RAM each, hard disk drive, DOS 2.1 or later.
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CIRCLE 666 ON READER SERVICE CARD

DeskSet Design Edition
G.O. Graphics
18 Ray Ave.
Burlington, MA 01803
(800) 237-5588 (outside Mass.)
(617) 229-8900
List Price: $1,995; Compugraphics Typesetter Driver option, $1,495; Compugraphics MCS Disk Conversion option, $495.
Requires: 640K RAM, hard disk drive, DOS 2.0 or later.
Not copy protected.
CIRCLE 664 ON READER SERVICE CARD

DeskSet PS Edition
G.O. Graphics Inc.
18 Ray Ave.
Burlington, MA 01803
(800) 237-5588 (outside Mass.)
(617) 229-8900
List Price: $995
Requires: 512K RAM, two disk drives, DOS 2.0 or later.
Not copy protected.
CIRCLE 665 ON READER SERVICE CARD

***LaserScript*, Version 2.0**
Command Technology Corp.
1900 Mountain Blvd.
Oakland, CA 94611
(415) 339-3530
List Price: $695
Requires: 512K RAM, hard disk drive, DOS 2.0 or later.
Not copy protected.
CIRCLE 660 ON READER SERVICE CARD

***MagnaType*, Version 1.6**
Magna Computer Systems Inc.
14724 Ventura Blvd.
Sherman Oaks, CA 91403
(818) 986-9233
List Price: $8,500 first unit master package for high-resolution typesetters, includes 3 days of training and 6 months of customer support. Purchase price decreases after first unit is bought. $5,250 first unit master package for PostScript laser printer version, including 3 days of training and 3 months of customer support. Purchase price decreases after first unit is bought.
Requires: 640K RAM, hard disk drive, DOS 2.0 or later.
Copy protected.
CIRCLE 658 ON READER SERVICE CARD

***ScenicWriter*, Version 4.3**
ScenicSoft Inc.
100 Second Ave. South, #250
Edmonds, WA 98020
(206) 776-7760
List Price: $695
Requires: 384K RAM, hard disk drive, DOS 2.0 or later.
Not copy protected.
CIRCLE 663 ON READER SERVICE CARD

***Spellbinder Desktop Publisher*, Version 6.31**
Lexisoft
P.O. Box 1950
Davis, CA 95617
(916) 758-3630
List Price: $695
Requires: 256K RAM, two disk drives, DOS 2.0 or later.
Not copy protected.
CIRCLE 652 ON READER SERVICE CARD

Superpage II
Bestinfo Inc.
Rosetree Corporate Center
1400 N. Providence Rd., #117
Media, PA 19063
(215) 891-6500
List Price: $7,000
Requires: 640K RAM, one disk drive (hard disk recommended), DOS 2.0 or later.
Copy protected.
CIRCLE 651 ON READER SERVICE CARD

SuperPrint
Janus Associates
94 Chestnut St.
Boston, MA 02108
(617) 354-1999
List Price: $695
Requires: 384K RAM, two disk drives, DOS 2.0 or later.
Not copy protected.
CIRCLE 650 ON READER SERVICE CARD

mands can be saved as a macro and stored in a library for reuse.

For a batch program, *ScenicWriter* supports an incredible variety of graphics programs, including *PC Paintbrush*. In addition, Microtek and Datacopy scans and files from *MacPaint* or *Adobe Illustrator* on the Macintosh can be included. You can also tell the program to draw simple graphic elements such as ruled lines, boxes, and gray screens.

Spellbinder Desktop Publisher

The $695 *Spellbinder Desktop Publisher*, a Lexisoft product, is designed especially for use with the HP Laserjet. You use dot commands to define the position of text and graphics on a page. You can enter text directly in *Spellbinder*'s Edit mode or import ASCII files. A View mode lets you preview what the page will look like before you print it. *Spellbinder* offers a number of precise typographic controls, including word spacing, letterspacing, and leading control in 1/300 of an inch increments.

Spellbinder supports such graphics packages as *PC Paintbrush*, *AutoCAD*, and *1-2-3* .PIC files and scanning packages that support the .PCX format, including Microtek and Datacopy. You can also incorporate lines, boxes, and gray screens with text on a page.

Superpage II

Superpage II, a $7,000 product from Bestinfo, definitely comes in at the very high end of the PC publishing market (see "Bestinfo's Superpage II: Beyond Desktop Publishing," *PC Magazine*, Volume 6 Number 3). *Superpage II* is really more of a typesetting front end than a simple text formatter. Like *MagnaType*, *Superpage II* is best suited for driving phototypesetters, though it does support a number of laser printers.

Superpage II lets you format text by either embedding codes or using menu commands to indicate simple formats, such as boldface and italic. *Superpage II* includes a preview mode, and many commands are executed from pop-up menus. *Superpage II*'s embedded codes can call up format files, which hold a series of complex instructions for controlling the appearance of text on the page.

Superpage II has built-in graphics tools for drawing lines and rectangles, as well as screen fills. The package also allows you to import graphics from packages such as *PC Paintbrush*, *Windows Paint*, and *GEM Paint*.

SuperPrint

SuperPrint, like *Spellbinder*, is especially well suited for use with the Hewlett-Packard Laserjet and other Canon-engine-based laser printers. The $695 package excels in its ability to use downloadable fonts and in optimized printing speeds. By using style sheets, you can control multiple columns on a page, tabs, line leading, and kerning.

SuperPrint boasts a wide variety of built-in graphics capabilities, including the ability to draw circles, ovals, and rectangles, with a choice of 72 different fill patterns. *PC Paintbrush*, *1-2-3* .PIC files, and *AutoCAD* files can be printed as part of a *SuperPrint* file. PC

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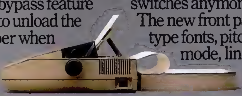

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CIRCLE 393 ON READER SERVICE CARD

→ **COVER STORY** → DIANE BURNS AND S. VENIT

Desktop publishers, beware. Don't use a page composition package until you arm yourself with the following basic principles of good page design and layout.

WHAT'S WRONG WITH *this* PAGE?

PC Magazine has a so-called desktop publishing wall of shame. On it, the editors have tacked the carcasses of letters and press releases they've received that were slain by the misuse of desktop publishing tools.

That wall proves the claim of graphics professionals that desktop publishing puts powerful page-layout tools in the hands of people who don't know how to use them—and shouldn't be using them until they master the basics of page layout.

But you don't have to be a graduate of Pratt Institute or the Rhode Island School of Design to use desktop publishing tools to produce pages that are well designed and that communicate the message clearly. By understanding and implementing the following basic principles, you can avoid producing the kind of pages that have given desktop publishing a bad name. You may not win any awards in design contests, but you can be confident that your pages won't end up on anyone's wall. Remember that your goal is clear, not distracting, communication.

1. Don't crowd the page. Do use plenty of white space to give the eye a break.

One of the most basic principles of good design, this is also the one violated most regularly. Just because there's empty space on a page doesn't mean you have to fill it in with text or a graphic. Pages that are crammed with text from margin to margin are simply not inviting; the eye needs a rest.

At the very least, leave an inch-wide margin all the way around the edge of a page, and if economizing on the final number of pages isn't an issue, leave more space. For example, offset the left margin of text by 2 or 3 inches.

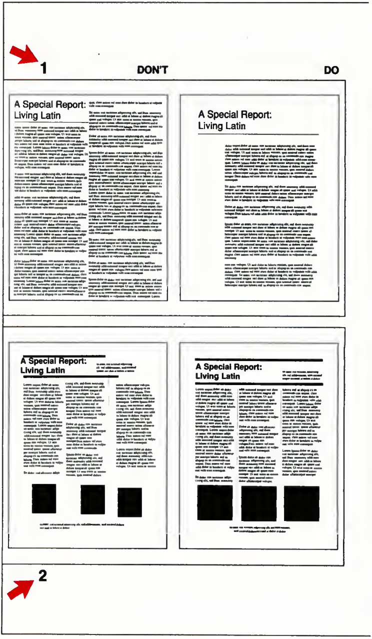
2. Don't allow objects to wander over the page. Use a grid system to ensure that everything lines up.

A grid refers to the underlying structure of a page layout. Designers have used very complex grid structures for well-known books, magazines, and newspapers. A grid structure, in its simplest form, ensures consistent alignment of margins, headers, footers, and columns.

Use the built-in tools in your word processor or page layout package, such as margin settings, column guides, and ruler measures, to establish a grid. Within the grid, use menu commands to align text and graphics rather than aligning objects visually. If, for example, you want a title on the left side of a running head, and a page number on the right side, use a right tab, if available, to align the page number where you want it rather than using spaces or moving a left-aligned block to the right. These last two techniques may get it right on the screen, but it will probably not print out the way you'd expect.

3. Don't clutter the page. Use graphics in a meaningful way.

With the widespread availability of click-art packages (floppy disks of predrawn art), beginners have a tendency to randomly add these graphics to a page, simply because they're there. But it's better to use only graphics that bear some meaning to the text, or if your goal is decorative, keep the graphics simple and small. Other techniques, such as using white space, may break up the page better than adding decorative graphics.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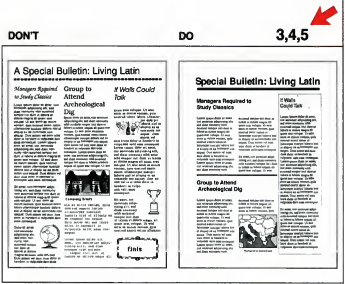
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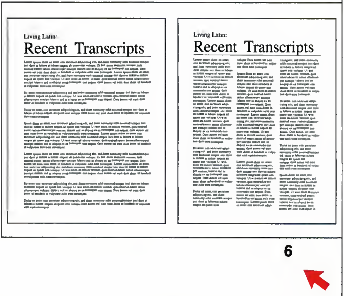

4. More is not better. Use the minimum number of fonts on a page.

People often use many fonts because they are available. Most designers mix no more than two different typefaces, such as a sans-serif face for headlines and a serif face for body copy. Too many fonts tend to make the page uninviting.

5. Use lines or screens to differentiate parts of a page.

If you are producing a document covering different topics, such as a newsletter, differentiate between stories by surrounding text with a thin rule or by dropping a screen fill behind special short features to highlight them and separate them from the rest of the articles. Ruled lines between columns can often make a page more inviting and easier to read.

6. Don't use text lines that are too long for the eye to follow.

There is a good reason why the pages in this magazine run text in two and, often, three columns. It is very difficult for the eye to follow text, especially in small point sizes, from one edge of an 8½-inch-wide page to the other. If you must use a small point size to fit more text on a page, be sure to break the page into at least two columns. Even regular text, that is, 12 point, is easier to read if it runs in columns no wider than 4 to 5 inches. Above all, the text should be easy to read. If the copy doesn't fit the space allowed, think about cutting out some of the text rather than reducing the point size or the space between lines.

7. Think about what you want to do before you do it!

The last tip is one that applies to many things we do, and page layout is no exception. Never sit down at your computer to produce a report or newsletter without thinking about what you are going to do.

Finally, there's nothing wrong with looking at well-designed pages in other publications that are similar to yours in content to get ideas for your page designs. You don't have to reinvent the wheel every time you begin a new document, and by following a few simple rules and practicing moderation when it comes to fonts and graphics, you should be able to produce documents you can be proud of.

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Wrong.

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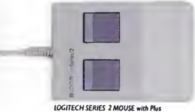
LOGITECH SERIES 2 MOUSE with Plus Software ... $99
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CIRCLE 133 ON READER SERVICE CARD

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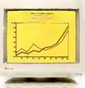

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IBM-CGA Compatible
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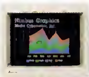
0.4mm pitch stripe mask



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CIRCLE 376 ON READER SERVICE CARD

DIANE BURNS AND S. VENIT

Finding the right page composition software is only the first step. A complete desktop publishing system will also require a significant investment in specialized hardware.

DESKTOP PUBLISHING: OUTFITTING YOUR SYSTEM

Purchasing software is just the first step in outfitting a usable desktop publishing system. Next comes the hardware. And making those purchases can make you feel like you're on a "Wheel of Fortune" shopping spree.

You can find products that claim to be "for desktop publishing" that run on a single-disk-drive MS-DOS computer. But all of the page composition packages that we review here require at least 512K bytes of memory; a hard disk drive, $600 and up; a graphics card and monitor, which run from $300 for a low-cost EGA to more than $2,000 for a 19-inch two-page display; and a mouse, for $100 to $200. For the final output, you also need a high-resolution laser printer, which will cost roughly $2,000 to $5,000; you can purchase downloadable fonts for your laser printer for $200. High-volume publication departments and service bureaus can justify the investment in the PostScript-language phototypesetting equipment that is supported by most of these packages.

A full-service publications department will also want to add a scanning device for digitizing photographs, logos, and line art that already exist on paper. Such a device will run you about $1,000.

The following discussion gives the background that you'll need in order to make wise hardware purchases for desktop publishing.

COMPUTERS Because of the RAM and storage requirements of most desktop publishing software, you'll need at least an AT for your system. If you expect to be publishing a large volume of pages, and especially if you'll be including many graphics, you'll appreciate the faster performance of an 80386 system. For reviews of available 80386 systems, see "Heavy Metal—386s Weigh In" (*PC Magazine*, Volume 6 Number 16). (None of the packages reviewed are helped by, or support, a math coprocessor.)

MONITORS One of the keys to desktop publishing, as we define it, is WYSIWYG, or what-you-see-is-what-you-get. It's imperative that the screen offer as close a representation as possible to what will finally print on a laser printer or other high-resolution device. The higher the resolution of the monitor, the closer the resemblance of the screen image to the printed page.

Discriminating desktop publishers are opting for large screen displays, which not only offer a (usually) higher resolution than smaller screens, but also show a larger part of the page than the standard 12-inch monitor, on which you can only see about one-third of an 8½- by 11-inch page in an actual-size view. We believe these larger displays will become standard in serious publishing environments, as they offer great time savings over small-screen systems that force you to scroll the screen or zoom in and out of various views of the page.

The downside of these large displays is that you need to make sure your monitor has a driver for your software. While most page composition software will drive the major large displays, your 4-year-old word processor might not.

You can find a number of types of large monitors on the market. Some vendors, such as Micro Display Systems, with its Genius monitor, are offering high-resolution, single-page displays, while others offer larger, 19-inch monitors that allow you to display two pages on-screen at once. The monitor you choose should depend on the type of pages you'll be publishing, the volume you intend to produce, and most importantly, the size of your budget.

> The big news for desktop publishers is the advance of scanner technology and the text- and graphics-reading software that goes with it.

Magazines and book publishers will find larger displays that allow simultaneous views of two pages essential for conceptualizing and producing facing page spreads. But the price for 19-inch monitors is steep. For instance, both Moniterm Corp.'s Viking I monitor and Sigma Design's LaserView Display retail for $2,395. On the other hand, the popular Wyse 700 single-page large display lists for $995.

Many desktop publishers may find they'd rather change views frequently on their standard 12-inch EGA displays than pay the price for a 19-inch monitor. But if you produce pages in high volume, the time savings gained from the ability to see the entire page at once, in a size that can be read and edited, may be worth the additional investment.

INPUT DEVICES The advantages of using a mouse in graphics and desktop publishing applications are old news now, and the virulent antimouse clamor witnessed in the PC community 1 year ago has quieted down, for the most part. In our reviews of mice in "Mice for Mainstream Applications" (*PC Magazine*, Volume 6 Number 14), we gave our Editor's Choice recommendation to the Logitech Bus and Serial Mice for their low $119 and $99 prices and excellent "feel." The PC Mouse and PC Mouse Bus Plus from Mouse Systems Corp. were given an honorable mention. However, the mouse market leader is Microsoft.

The big news for today's desktop publisher is the advance of scanner technology and the text- and graphics-reading software that goes with it. (For reviews of scanners, see "Scanners Take Off" in this issue.) Scanners are a good source of graphics if you're not a fine artist. You can use them to bring existing logos, line art, and, in some cases, photographs on-line. The software that accompanies scanners is evolving to offer many of the features of paint program software, with eraser and pen tools for touching up scanned images. With the right combination of scanner, page layout program, and printer, you can produce high-resolution graphics that look like inked line art or halftone photographs.

The advantages of having all of the graphics on-line are that they can be scaled and cropped to fit the page on-screen (thereby saving photostating charges) and they become permanently integrated with the rest of the page layout (that is, they don't have to be pasted up every time you print a new version).

The disadvantages of scanned images are that they can require a great deal of memory and disk storage space, they still appear slightly jagged at the edges compared with the object-oriented computer graphics that are created with drawing programs, and they are still somewhat coarser than true halftones for photographs. This is one area that is likely to improve significantly over the next few years, however, as file formats (such as TIFF and compressed TIFF) improve and become standardized.

Text-scanning (OCR) technology has also improved over the past few years, getting faster and more accurate. The breakthrough with most relevance for desktop publishers is that some scanners can interpret typeset text in various sizes (whereas in the past OCRs could read only special characters or typewritten text).

OUTPUT DEVICES The high-resolution (300-dot-per-inch) laser printer is rapidly becoming the standard office printer, but a complete desktop publishing system requires a small library of typographic fonts and the ability to handle graphics. In

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order to do this, a page description language (PDL) is necessary. The most widely used PDL is PostScript (by Adobe Systems). PostScript has been implemented in dozens of laser printers and at least two phototypesetters, and it is likely to receive much wider acceptance after the announcements of PostScript support from IBM and Hewlett-Packard (which will support PostScript boards produced by third-party vendors for HP printers).

Laser printers first became popular as quiet, fast replacements for daisy wheel printers, but desktop publishing has been at least partially responsible for the current growth in laser printer sales. The most popular laser printer on the market, the Hewlett-Packard Laserjet, is a perfect replacement for daisy wheel printers, but because it lacks a page description language, it needs some help to become a powerful publishing printer.

If you already have an HP and want to use it to produce beautiful pages, you'll need to invest in additional fonts. Soft fonts, or downloadable fonts, give the HP the ability to produce a much wider variety of font styles in a larger range of sizes than the limited number supplied on cartridges. Even Microsoft's excellent Z cartridge, which offers twice as many fonts as a standard cartridge, only goes up to 18-point Helvetica and Times.

> Hardware manufacturers have begun to bundle page composition packages with their equipment to present complete desktop publishing solutions.

Font software sends the information about the desired font to the memory of the printer. As a result, you'll need more memory in your printer, and files will frequently take longer to print.

PostScript printers, such as the Apple LaserWriter, IBM's Pageprinter, and printers from QMS, AST, and Dataproducts, on the other hand, offer virtually an infinite number of type sizes and styles, since the font information is usually built into the ROMs of the printer or on a board.

And while you'll have difficulty producing even simple graphic touches, such as white type on a black background, on the HP, you can achieve almost any effect when you use a page description language such as PostScript. In addition, by using a PostScript printer, you automatically have access to Linotype's PostScript phototypesetters, the Linotronic 100 and 300. There are also a number of higher-resolution PostScript plain-paper laser printers available, such as a 400-dpi model from Compugraphic and Varityper's 600-dpi laser printer. For more information on printers, look for our special issue on the topic in *PC Magazine*, Volume 6 Number 19.

In addition to page composition software, a complete desktop publishing system requires an 80286- or 80386-level computer, an EGA or other high-resolution adapter and monitor, such as the 19-inch Conrac 7250 shown here, a scanner, a laser printer, and a mouse.

Photograph Thom O'Connor

SYSTEM SOLUTIONS Because of the sheer volume of hardware required for a desktop publishing system and the potential for compatibility conflicts that it entails, hardware manufacturers have begun to bundle page composition packages with their equipment to present complete desktop publishing solutions. For example, IBM's SolutionPac includes complete page composition software (*Microsoft Windows*, *Windows Write*, *Windows Paint*, and Aldus Corp.'s *PageMaker*), the Personal System/2 Model 30, the PS/2 display and mouse, the IBM Personal Pageprinter with a PostScript adapter card, and optionally, the IBM 3117 scanner. IBM will bundle *PageMaker* and *Windows* with the Personal Pageprinter and adapters in an upgrade kit for XTs and ATs.

The SolutionPac introduces two major innovations in system packaging and support. First, all of the software is already installed on the hard disk by the manufacturer. The user will acknowledge acceptance of all licensing agreements by inserting the one-time startup disk, instead of opening different sealed envelopes and following instructions for installation. Second, IBM offers direct support for all of the software bundled with the SolutionPac, rather than forcing the user to call five different vendors to answer a single question (such as, "Is my printing problem a function of the hardware, the operating system, the drivers, the graphics, or the page layout?").

Other hardware manufacturers that are bundling page composition software with hardware to create complete desktop publishing packages include Hewlett-Packard, AST, Cordata, Canon, Epson, Ricoh, and Taxan. You can find similar packaging of complete hardware systems with desktop publishing software through VARs and retail computer dealers.

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SCANNERS Take Off

Scanners have received an enormous boost from desktop publishing's rise. Creating, editing, and arranging graphics and text electronically is one of the primary functions of desktop publishing. Scanners are the hardware that permit desktop publishers to take material that has already been typed, drawn, and photographed and use it in electronic format without having to retype, redraw, or rephotograph it. Because of their value for desktop

Desktop publishing is a boon for the scanner and OCR market. The number of products has more than tripled in the past year, and improved OCR technology now allows the most sophisticated products to read typeset text.

publishing applications, scanner sales are expected to soar, according to market research firm Dataquest. By the end of the decade, The Gartner Group, another market researcher, predicts that scanner sales will top $400 million.

Obviously, these figures have not been lost on manufacturers, who have raced to bring new products to market. The number of scanners that are available has more than tripled since *PC Magazine* reviewed nine of these systems just 1 year ago (see "Page-to-Disk Technology: Nine State-of-the-Art Scanners," *PC Magazine*, Volume 5 Number 16).

The scanner product group includes graphics scanners, optical character readers (OCRs), and facsimile transmission (fax) units. Graphics scanners make electronic copies of drawings and photographs and convert them into a bit-mapped format that can be edited with a paint program. OCRs scan text and convert it into a format, such as ASCII or DCA, that a word processor can understand. Fax digitizes images to send and receive information.

■ OCR capabilities took a leap forward with the introduction of products that read typeset text.

Software controls all scanning functions. In fact, most scanner vendors bundle their own software with their scanner engines, which are built by Canon, Ricoh, Microtek Lab, and Panasonic.

Both graphics-scanning and optical character recognition (OCR) software (as well as fax software) can run on the same scanner engine, but most scanners require separate passes of the document to scan for graphics and for text. Since most, though not all, of the 32 products reviewed here can do graphics scanning and OCR, we evaluate both here.

Most of the scanners we review are desktop units, which range in price from $2,000 to $10,000. But if you're restrained by a tight budget, you have an alternative to buying one of these scanners: you can use a scanning attachment that fits onto your dot matrix printer or plotter. We review four of these attachments, which cost from $269 to $2,995. In one case, you can even rely on a plotter as the base unit for a scanner. Also, we look at the Saba Handscan and TransImage scanners, special-purpose hand-held scanners that, although not low in cost, can be used to make electronic clippings.

IMPROVED FUNCTIONALITY While scanner functions have remained constant over the past year, OCR capabilities have taken a leap forward with the introduction of new PC products from Kurzweil Computer and TransImage that can read typeset, as well as typed, text. Just 1 year ago this capability was limited to machines costing $40,000 and up and required a minicomputer to process the data. Now Kurzweil Computer offers a $9,945 version of its high-end vanguard, the Kurzweil 4000. TransImage has introduced a $2,200 hand-held system.

The ability to read typeset text will greatly broaden the OCR's appeal. While older OCRs were able to recognize only limited numbers of typewriter fonts and were useful primarily for traditional office applications, such as document scanning and forms processing, these new OCRs can recognize a wide range of documents. Professionals can use them to read journals, magazines, and newspapers to create textual databases. Scholars can scan texts that have long been out of print and make indexes, concordances, cross-references, and corrections. Desktop publishers can reprint articles without retyping them. The list seems endless, although current storage and processing limitations govern the scope of some projects.

The Kurzweil and TransImage systems tend to overshadow all other progress in PC-based OCR. Most OCR software can still recognize only typewriter-style characters, usually monospaced, yet certain ones can now read better-quality dot matrix fonts. Some OCR packages now offer an "omni-font" capability, which means they can read most standard characters and pitches without requiring you to load a specific recognition library.

Many of the better OCR packages also include extensive formatting capabilities for popular word processing programs. This feature is important to desktop publishers that may develop formats based on those from existing word processors.

Another important development is a link between fax and OCR. You can now scan and send pages using facsimile transmission and then receive and process them using OCR software.

ORIGINS While American firms are responsible for advancements in OCR technology, the seeds for the current scanner boom were sown years ago in Japan, where developments in scanning technology were applied to fax.

Fax is one of the most economical and practical ways to transmit Japanese documents. While a document in English is composed of 256 ASCII character codes, including text formatting, a Japanese document can contain thousands of different characters, each with a separate code.

Rather than trying to process, transmit, and check all this data, the Japanese send documents as scanned images using fax. Some systems store the picture for later processing, but most print fax images as soon as they are received.

The speed, reliability, and lower cost of fax has commanded the attention of corporate America, which spends millions each year on overnight courier services. As the market for scanners heats up, we can expect more of the Japanese fax products to show up on this shore, repackaged as desktop OCR either for commercial sale or as part of a publishing or CAD package. Dest Corp. and Palantir already use value-added resellers (VARs) that create and sell applications for vertical markets such as medicine, forms processing, engineering, and so on, instead of general market applications.

HOW SCANNERS WORK The processing method a scanner uses determines what the final printed output will look like. And subtle differences in the way an image is processed can make a big difference in the final output, as you can see from the sample outputs in "Performance Tests: Graphics and Text Scanning."

All scanner technology is based on the principle that black absorbs light, white re-

FORMATS FOR SCANNER FILES

Scanners use a variety of formats for storing images so that you can use the images with a variety of paint and CAD packages.

Most scanners convert images into bit maps that you can edit using popular paint programs, such as *Halo DPE*, *PC Paint*, and *PC Paintbrush Plus*. Generally, the file extension will help you determine the format used: .PCX for *PC Paintbrush Plus*, .PIC for *Halo DPE* and *PC Paint*.

One bit-map format is emerging as a standard for scanned images—TIFF, or tagged-image file format. TIFF was originally developed for desktop publishing packages used on the Apple Macintosh. Desktop publishers and scanner manufacturers prefer TIFF because it offers portability between the Mac and the PC, reducing the time it takes to bring products to market for both systems.

In its simplest form, TIFF identifies the image bit map. You can then print the bit-mapped image, convert it into another file format, or include it in a desktop publishing document.

But TIFF offers much more than that. It is able to store multiple-resolution bit maps in a single file, so that you can select image resolutions for display or printing. If your software permits, you can also store gray-scale information. (The bit maps must be able to store the gray-scale information for each dot, which is something that most scanner software does not do as yet.)

Bit map files are useful, but they have one big disadvantage: most software arranges pixels into halftone dots, freezing the print resolution of the image. But if the software captures gray-scale information, TIFF stores it and makes it available to the software for manipulation.

POSTSCRIPT PostScript, the publishing standard for text, may hold the key to the final image file format. A new image standard, Encapsulated PostScript (EPS), stores scanned images using a kind of vector format based on PostScript. With EPS you can store and manipulate images as you do with bit maps, yet you can print them using device-independent PostScript code.

Adobe Systems, creator of PostScript, has a new drawing package called *Illustrator* in the wings, which gives you access to PostScript's fabled special effects without having to become a PostScript programmer. One of its unique features is the use of scanned images as templates. *Illustrator* will let you create four-color separations, halftoning, outline fonts, and drawings and manipulate images using Belzier curves and geometric primitives.

VECTOR FORMATS CAD software uses vector formats. Raster-to-vector conversion programs are necessary to convert drawings into a format that CAD software can use. The accompanying sidebar "Raster-to-Victor Conversion Software" looks at three programs that can convert raster images to vector images: *CAD/camera*, *CADmate*, and *ScanPro*.—**Tom Stanton.**

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flects it, and anything in between reflects a percentage of light based on its value. Most scanners currently cannot scan in color, so the in-between values are usually shades of gray, or what is often called gray scale. (The Howtek and SpectraFAX scanners were the only two color scanners we tested.)

To scan an image, you feed the scanner an image on a page. The scanner illuminates the image, then measures the percentage of reflected light using a photocell. Most scanners use a CCD (charged coupled device), which is an array of photo elements that measure the reflected light intensity as a voltage level. Black areas reflect no light and generate no voltage, white areas generate the highest voltage, and gray values generate voltages in proportion to the amount of light reflected.

CCDs and similar devices, however, cannot measure an unlimited range of voltages. For example, if a photograph has 500 gray shades, there are 500 possible voltages with a 1 percent difference between each level. The CCD's signal-to-noise ratio determines the actual number of voltages it can measure. If the CCD has a signal-to-noise ratio of 3 percent, it will be unable to measure accurately more than 100 voltage levels for the photo in our example. As a result, you lose some gray-scale information.

Scanners use algorithms to translate the analog voltage levels that represent the gray-scale information into digital bit patterns, or pixels. The most common bit pattern is a 4-bit pixel, or picture element. A 4-bit pixel has 16 different combinations from all 4 bits on (black) to all 4 bits off (white), with different bit patterns in between.

The scanning software then uses these pixels to approximate gray tones on the screen or on a printout. In addition to the limitations in measuring gray-scale information, the software limits the ultimate number of gray tones available for processing. If a CCD can handle 50 shades of gray but the software uses only 4-bit pixels, you lose a lot of gray-scale information.

One way around this problem is to store gray-scale data in analog form first, before converting it into digital form. In analog form, the software can manipulate the values of the voltage levels. Microtek Lab's scanner engine is currently the only one, though, that allows you to manipulate gray-scale information in analog form before converting it to a bit map.

IMAGE PROCESSING Most scanners convert gray-scale information directly into bit maps. The form the bit map takes depends on the type of image scanned.

The simplest images have no gray-scale information at all; an area is either black or white. Commercial printers call such images line art, while engineers refer to them as bitonal. Because the scanner does not have to measure any gray scales, it establishes a threshold, or cutoff point, that determines whether to convert the various voltage levels from the CCD to black or to white pixels.

Line art may seem easy to print because it lacks gray-scale information, but one potential problem during the scanning phase may affect the final output. Alignment on line art is critical if you want to avoid stairstepping on straight lines or curves. You don't need to be off by much for a 300 dot-per-inch (dpi) scanner to start showing steps or jagged edges ("the jaggies") on long lines.

Most scanners use a roller-platen mechanism, which makes it difficult to get 100 percent perfect alignment. But a number of companies, including Datacopy Corp. and Microtek Lab, offer flatbed scanners, which facilitate more-accurate alignment.

Surprisingly, resolution is more important for line art than for continuous-tone images. Arcs, curves, and radii in line art require higher resolution to avoid "the jaggies." Typical scanners, which offer 300-dpi resolution, will be suitable for line art for most PC applications, but if you're converting large engineering drawings, you'll find you need the much higher resolution available with large flatbed scanners designed specifically for CAD production.

HALFTONING Printing continuous-tone art, which is made up of various shades or values of gray, presents the greatest challenge to scanners. Photographs are the most common example, but an artist's sketch in charcoal or pencil also has multiple shades of gray.

Scanners use a process called halftoning, similar to that used by commercial printers, that uses patterns of dots to create the illusion of continuous gray tones. If you look closely at any photograph in a newspaper, you'll see a pattern of dots.

The printer creates these dots using a halftone screen, a plastic or glass plate marked with a pattern of dots. He places the screen between the original and a negative and takes a picture. The halftone screen blocks part of the light out in a regular pattern, which creates the dots that are printed.

While the number of dots per inch is always the same, halftone dots vary in size in a way that corresponds to the value of gray. Darker gray values have larger dots, while lighter values have smaller dots. When the picture is printed, the press simply deposits these dots onto the page, creating the illusion of gray tones.

The quality of this illusion depends on the number of lines in the halftone screen. Newspapers use screens with 65 lines per inch (lpi), while most magazines use 120- or 133-lpi screens. Art books often use screens of much higher density, but they are often printed on high-quality presses that are beyond the needs of most other publishers.

Similarly, scanners also create halftones for printing, but they must take a different approach. Most laser printers produce 300 dpi, but each dot is exactly the

A GLOSSARY OF SCANNER TERMINOLOGY

Alignment The position of an image in relation to the scanning optics. Poor alignment causes line art to have stairsteps in straight lines and jagged edges on curves.

Bit map An array of bits that form the contents of an image file. Bits are either on (black) or off (white). The arrangement of the bit map depends on the scanner's resolution and the file format. Most scanned images are converted to bit maps for editing and printing.

Bitonal Another term for line art. Bitonal has only two values, black and white.

Brightness Scanner control that determines how much light will be measured. Brightness does not change the setting of the scanner's light source, but does set the upper and lower limits on the CCD. Contrast, brightness, and density are used interchangeably.

CCD Charged coupled device. An array of photosensors that convert light into electricity. CCDs convert light intensity into voltage levels that represent a range of gray tones, or gray scale. This analog data must be converted into bit maps or stored in a special file format.

Continuous-tone images Images that have an almost infinite range of values or tones. Photographs, which are the most common example, may contain over a million tones of gray.

Contrast A brightness control that sets the upper and lower limits on a CCD. Contrast, brightness, and density are used interchangeably.

Density Density means different things to different people. Some scanners use the term synonymously with contrast or brightness. Others use the term to refer to halftone screen density.

Dithering The arrangement of pixels to form halftone dots of various sizes and shapes for printing. Most scanners dither images automatically and convert them to bit maps for editing or printing.

Dots per inch Scanning resolution is measured in dots per inch, which describes the number of image samples taken in an inch. Scanning resolution usually matches printing resolution.

EPS Encapsulated PostScript, a new graphics file format that stores PostScript images. EPS files are easily transported across PostScript systems and offer device-independent printing.

Fax Facsimile transmission, or fax, moves an image rather than the ASCII contents. Some software can convert fax into OCR-readable files after they are received.

Feature extraction A method of recognizing characters. Feature extraction examines the shape of a letter during the recognition phase. Feature extraction uses the topology of the letter instead of its shadow.

Flatbed scanner Usually a large scanner with a fixed copyboard (the flatbed) and adjustable optics. Some flatbed scanners move the scanning optics across an area automatically. Others require separate exposures.

Gray scale The range of gray values that the scanner can measure and process. For instance, a photograph might contain as many as a million gray tones. Limitations on the scanner's ability to measure and process those tones often effectively limit the scanner's gray scale to as few as 16 tones.

Halftone A process that converts continuous-tone images into a pattern of dots for printing. Halftoning uses screens with a fixed number of dots per inch. Newspapers use 65 lines per inch (lpi), while magazines use 120-lpi screens. Gray values are represented using various dot sizes: the larger the dot, the darker the gray value.

Learn mode An OCR feature that allows the storage of additional fonts based on existing conditions. For example, laser-printed Courier may be a few pixels thicker than a letter-quality Courier, in which case the software must be taught the new font.

Matrix matching An OCR system that compares a scanned bit map of a character with known character bit maps. If a match is found, the software sends the correct ASCII code; otherwise a character flag may be sent. Matrix matching is sometimes limited to monospace characters in specific fonts.

OCR Optical character recognition. The scanning and recognition of characters on paper for use in computers.

.PCX A graphics file format based on Z-Soft's *PC Paintbrush Plus*. The .PCX file is a fixed-resolution bit map.

.PIC A graphics file format based on Media Cybernetics' *Dr. Halo II* and *Halo DPE*. The .PIC file is a fixed-resolution bit map.

Pixel Picture element. Most scanners use a 4-bit pixel to store 16 gray scales in a bit map file. Pixels are arranged in a dither pattern to form halftone dots.

Platen feed Common paper transport for scanners and OCR. Paper is fed through a path and held in place by two rollers. Platen feeds are useful with OCR but may cause some misalignment on image files, particularly line art.

Resolution In graphics scanning, the number of samples taken for a given line measure. Three hundred samples per inch translates into 300 bits per inch. A full page uses 1.05 megabytes. Most scanners offer resolutions that match laser printers (300 dpi) down to dot matrix (75 dpi). In most cases the scanned resolution is fixed in the bit map output.

Scan, scanner, scanning A generic term that includes all forms of image digitizing. Graphics scanning usually refers to digitizing pictures. OCR uses character digitizing as a step toward recognition. Fax uses image digitizing to send and receive information.

Skew The slant of an image in relation to the scan optics. Skew is used primarily in OCR to measure the margin of error allowed for character recognition. Letters that are askew in the bit map cannot easily be read by most software.

TIFF Tagged-image file format. A method of storing graphics that uses tags to identify graphic elements.

Vector A position statement based on geometric parameters, which give digital start and end points; as opposed to a bit map of an image.

same size, and there's no way to change the size to produce the necessary halftone effect. Instead, scanners group pixels containing the gray-scale information into patterns that approximate halftone dots.

The most common method is called dithering, which automatically groups four sets of 4-bit pixels into 16-dot sizes for halftoning. Some manufacturers also offer variations on halftone dot size, giving you more control over the final product.

Dithering has one disadvantage: it ties image resolution to the output engine. A 300-dpi laser printer that uses an 8 by 8 halftone dot pattern creates only a 37-lpi halftone, which is well below newspaper quality of 65 lpi and light-years away from magazine quality of 120 or 133 lpi.

Once dithered, the image's gray scale, resolution, and halftone dot size are fixed. So even though your printer might have a high-resolution PostScript engine, the image will print at the resolution and quality at which it was stored.

Considering its 37-lpi halftone limitation, why would anyone want to use a scanner? It depends on what you want to use the image for. For instance, if you've purchased desktop publishing software as part of a professional publishing system that's linked to PostScript typesetters, you're better off sending the original to a commercial printer for halftoning. You could use the scanned image, though, for proofing, or for indicating the position of the actual art.

If you're using a laser printer for camera-ready copy, you may find the halftone resolution sufficient for your needs. Using the scanned image can save you the money and time required to have photographs halftoned or placed by a printer.

One way around the problem of dithering is to store the gray-scale information with the image in analog form and to use software to enhance it before converting it to digital form for printing. You won't get better resolution than the scanner used to scan the image, but you can improve the quality of the halftone considerably. Another method is to store images using Encapsulated PostScript (EPS), which allows for processing with PostScript (see sidebar "Formats for Scanner Files").

STORAGE Once you've processed your image, you have to store it. Images are like Godzilla; they need a wide berth. A full page scanned at 300 dpi takes up nearly 1 megabyte of space, and so a 20-megabyte hard disk could store only 18 images.

Line art offers lots of ways around the storage problem. The most common method is to compress large areas of black and white by using algorithms that encode some of the black and white areas. These algorithms can compress some images by a factor of 3 or 4. Decompression programs also come with the systems. You can also convert CAD drawings, which are usually very large, to vector format. They take up less space in vector format, which gives just the geometric parameters of the image, than in bit-map format.

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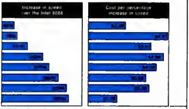

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Although you cannot compress continuous-tone images, it's rare that you will need a full 8 by 10 image. Usually you need only a part of an image, which may take only 200K to 300K bytes of disk space. Most scanner manufacturers let you set the dimension of the scanned area so you can skip over needless bits, and some others offer multiple scanning areas on a page so that you can choose to scan part of the image rather than all of it.

OCRs OCRs scan text as if it were line art. But the OCR software must not only process the image, it must recognize the text character that the image represents and convert it into ASCII format or some other format that word processors can understand.

Although each OCR manufacturer claims to have a proprietary character recognition scheme, most use either matrix matching or feature extraction. Matrix matching is the most common method. Most software programs that recognize monospace characters use this technique. Once a character is digitized, an OCR using this technique isolates it in a 24- by 35-bit map and then compares it to a library of known character bit maps. If it finds a match, the software generates the appropriate ASCII code for the letter.

While this method might seem simple, it has a few problems. If you compare every bit in a 24- by 35-bit matrix, you'd have to process over 100 bytes per character, spaces included, as you try to find a match. And if a character is tilted or skewed, the OCR will find it difficult to recognize in matrix matching, even though all the character information is present.

Manufacturers have found ways to get around these problems. Because an *L*, for instance, is easy to distinguish from an *A*, most OCRS do not have to match every bit to recognize the characters. Instead, they can compare hot zones within the matrix to make a match. If that fails, they compare more bits until they find a match. Some manufacturers slide the matrix, or tilt it using algorithms, to make a match. If all fails, the software sends a flag indicating an unrecognized character.

Feature extraction, or pattern recognition, takes a different tack from matrix matching. Instead of comparing the bit map, the software examines the arrangement of the bits composing the letter. If the software sees a long vertical row of bits followed by a shorter horizontal row, it knows that the character is probably an *L*.

While OCR software using the feature-extraction method must examine more bits and can take longer to find a match than software using the matrix-matching technique may need, it can read a wider range of fonts than matrix OCR programs. In fact, most OCRs that can recognize proportional typeset characters use some form of feature extraction.

Some OCR systems enhance character recognition by using a variety of software tools. Some OCRs offer numeric-only and alpha-only context mode. Switching to numeric-only mode—for instance, when you use the OCR to scan spreadsheets and financial statements—enhances the accuracy and speed of recognition, since the software must match only ten numerals and from three to ten punctuation marks.

Other OCRs take into account the proportion of letters to numbers in the document when searching for a match. For instance, if you're scanning a spreadsheet, the software would determine that in most cases a scanned character is likely to be a number, and it would consider numbers first when attempting to recognize a character. A few OCRs also include user-definable lexicons as part of the context-based software.

■ While no OCR was able to recognize dot matrix text last year, many OCRs can do so today.

Most OCR packages also offer a correction mode that enables you to override the OCR's decision and send a character directly from the keyboard. Some programs combine the correction mode with a learning mode, which lets you add characters to the recognition library. A learning mode is useful when you have documents in an unknown type style or of quality that is slightly off from the known library of characters. But it takes time and patience to build a good library of your own.

OCR accuracy is an elusive thing to measure. We found that with some OCRs, you could submit the same sample five times and get five different results with regard to errors and flagged characters. One possible reason is that letter-quality printers produce a thinner character than laser printers, so although the visible quality of the character hasn't changed, the thickness of each stroke in the letter has. The resulting 1- or 2-pixel difference may throw off some OCR software, particularly programs that use matrix matching. In every case, the quality of the original plays a major role in determining the accuracy of the OCR output.

One problem that continues to plague some OCRs is the inability to recognize dot matrix fonts. The letter *L*, for example, printed with a 9-pin matrix printer, contains 11 dots (7 for the stem and 4 for the leg), which may be too little information for the OCR to make a match. Yet while not one OCR was able to recognize dot matrix text last year, a number of OCRs are able to do so today.

THE EXTRAS Graphics scanning and OCR are but two of the possible applications for scanning engines. Fax is the third. Fax fits in well, both with graphics scanning and with OCR, since it lets you send pictures and text at one location and then receive and recognize the document at the other.

Although fax isn't nearly as big in the United States as it is in Europe and the Orient, that's beginning to change. Already, manufacturers have introduced a number of fax boards that are designed to work with existing scanning engines, including the Canon and Ricoh engines. And Datacopy, Microtek Lab, Dest, and others now offer fax options for their scanners.

ADD-ON SCANNERS Scanners that you mount on your printer's printhead are a low-cost option to desktop units. The actual scanning techniques they use are the same as those desktop scanners use, but add-on scanners rely on the printer's ability to move the printhead back and forth across the page to read the image.

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PC 101387

The add-on scanners themselves, then, rotate the platen in small vertical increments until the entire page has been scanned. They assemble the scanned information into an image that can be displayed on the screen or stored in a disk file for printing later.

This approach has a number of advantages. Since many users need printouts long before they need a scanner, it's a safe bet that many people contemplating a scanner purchase already have a printer on hand. The printer already includes the motors and controls to move the head back and forth and to advance the paper past the scanning line. The printer also has some sort of an interface that allows the scanner to receive instructions from a computer.

The design is not without its problems, however. First and foremost is the fact that timing is of little importance to a printer. When a printer is asked to produce a line of text, it advances the head to the next position, fires some pins, and then advances to the next position. As long as it knows its place on the line, it can produce consistent results. Not all printheads move at the same rate, however, which can create problems for an optical device reading a steady stream of data as the printhead shuttles back and forth.

The next problem is that the optical devices used in these units are highly sensitive. You must mount the light source and the sensor at precisely the right angle to the paper (which is a neat trick to accomplish when aiming at the curved platen surface), while maintaining a precise distance from the page. The tolerances for these adjustments are minuscule; resting your finger on the optic device of some units will create a significant change in the focus.

The third major complication is that the majority of dot matrix printers are connected to their computers via a parallel interface. The parallel interface is the most common one because it is such a widely used standard and because it essentially involves setting no configuration parameters. The alternative is the "standard" serial interface, which requires arcane settings for baud rate, word length, stop bits, parity, and handshaking protocols, not to mention the myriad of "standard RS-232" cables available.

The problem with the simpler parallel interface is that it is a one-way street, designed to pipe data from the computer to the printer. So how can a scanner send its image data back again? Some scanners rely on the serial interface, with its bidirectional data flow, and others require both a parallel and a serial interface to work.

Like the desktop scanners, add-on models also confront the thorny problems of resolution, file formats, and how to store the image in a form that you can put back on paper.

THE FUTURE Probably the best news for buyers is that scanners will remain relatively stable for the next few years. Hardware won't be able to do much more than 400-dpi resolution. This restriction will remain in effect partly because of cost and largely because PCs are currently unable to process all the data necessary to create such high-resolution images. Some OCR manufacturers are introducing interface boards with coprocessors that will speed up image and OCR processing without conflicting with existing PC hardware.

While older generations of scanner engines included optics and preprocessing hardware and software, today's scanners use software to do the processing. You can expect improved software, particularly for better manipulation and storage of grayscale information, but it will run on today's hardware.

TRADE-OFFS Although most systems offer OCR and scanning, each manufacturer has emphasized what it does best. Leaders in OCR, such as Kurzweil and Dest, offer acceptable image processing, while front-runners in image processing, such as Datacopy and Microtek Lab, offer adequate OCR.

Your choice of machine depends on what's important for you. If you intend to use a scanner for CAD, you'll need high resolution and excellent line art alignment, so flatbed scanners at 300 dpi or higher are the first place to start looking.

For desktop publishing you'll need high resolution and good alignment, as well as halftoning options and some OCR.

For archiving images in an image database, you may not need high quality. A lower-resolution scanner makes sense because you save on storage, display time on-line, and print time during production.

If you do a lot of forms-processing work, you're more likely to want OCR that allows you to enter format codes and offers omni-font recognition.

Whatever your needs, you have a wider range of options than ever before and prices that are finally reasonable. As you'll see, the differences between last year's products and this year's are staggering. The reviews that follow, arranged alphabetically by vendor, will help you find the scanner that best serves your application.

OUR REVIEWERS

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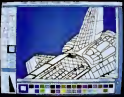
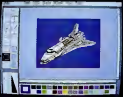
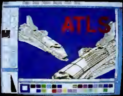
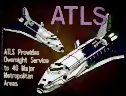

One screen of a 64-screen image.


Shrink down to a manageable size.



Next, cut-and-paste . . .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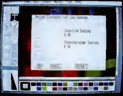
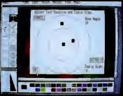

Easy-to-use menus.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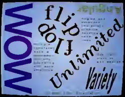

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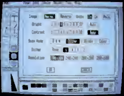
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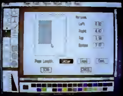
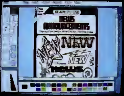

Scan all or part of a page.



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Desktop Scanners and OCRs

ABATON TECHNOLOGY CORP.

Abaton Scan 300

Abaton Technology Corp. is a supplier of scanners to the Apple Macintosh market that is striving to become equally as prominent in the MS-DOS arena.

Given the Mac's penetration into corporate America, especially in the area of desktop publishing (for which scanners are a natural adjunct), a scanner compatible with both the Mac and the PC would be an easy addition to the approved-buy list.

Scanners usually operate with some form of high-speed parallel interface on PCs, but the Macintosh has only serial ports. Abaton understands this dichotomy, and all its scanners are equipped with both interfaces. They also offer software for both machines.

Abaton submitted a Scan 300 scanner for this project. This is yet another Microtek roller-feed scanner, basically a fine performer. Abaton sells this $3,195 model for optical character recognition on the PC, and this is how we tested it. Abaton also offers less-expensive roller and flatbed scanners designed for both graphics and OCR on both the Mac and the PC.

The Abaton Scan 300 has both parallel and serial interfaces on its rear panel, but the parallel interface is via Abaton's half-length interface card rather than a standard PC parallel printer port. The scanner is reasonably large, and you must leave extra room in front for the scanned original to roll out onto your desk. A standard Scan 300 feeds only one sheet at a time; if you need multiple-sheet capabilities, you can buy a sheet-feeding attachment.

All of the Scan 300's scanner functions are controlled by software, so there are no controls on the scanner. Our Scan 300 was supplied with Abaton's *ACR* optical character recognition software, an OEM version of the ubiquitous *ReadRight* program. A device driver controls the hardware from your CONFIG.SYS file.

Since the software controls the functions of the Abaton Scan 300, you won't find any controls on the scanner, which is a relabeled Microtek roller-fed model. To accommodate both PC and Macintosh users, Abaton includes parallel and serial interfaces.

Photograph: Thom O'Connor

PC MAGAZINE FACT FILE

Abaton Scan 300
Abaton Technology Corp.
7901 Stoneridge Dr., #500
Pleasanton, CA 94566
(415) 463-8822

List Price: $3,195 (Includes the ACR optical character recognition software and *PictureScan* graphics software. The *PictureScan* software was not available in time for the review, but users who purchased the Scan 300 paid full price in expectation of receiving it when it became available in late August.)

Requires: 384K RAM, two disk drives (hard disk recommended).

In Short: Though slightly more expensive than other systems that use the Microtek engine, Abaton's good track record, solid software, and good interfaces for both the Mac and the PC make it a solid player.

CIRCLE **642** ON READER SERVICE CARD

SOFTWARE The *ACR* software is menu-driven via function key options. The user interface is easy to grasp, and little reference to the short manual is really necessary. *ACR* lets you adjust the scanner's operation with regard to the print intensity of your source, contrast, brightness, paper length, on-screen display of the scanned characters, and the form of the resulting file. You can specify straight ASCII, *WordStar*, or *WordPerfect* format from *ACR*'s main menu.

A utility called Read-In also can convert scanned files into *WordStar*, *WordStar 2000*, *Symphony*, *PFS:Write*, *MultiMate*, *Displaywriter*, *PC-Write*, *Canonwriter*, and *Microsoft Word* formats, and you can also control how the conversion handles returns at the ends of lines and page breaks. The utility is memory resident and sits quietly by, waiting for you to invoke it while you're running your word processor.

ACR also lets you restrict the scan down to a portion of the input page. This is useful for excluding graphics elements such as letterheads or signatures, which cause the software to generate gibberish, or for originals with multiple columns. You can also scan an image into memory (if it will fit) or to disk, and then perform OCR on the memory image.

ACR can read a long list of fonts in

■ Abaton's *ACR* software can read a long list of fonts in point sizes ranging from 6 to 14.

point sizes ranging from 6 to 14. It's not particularly bothered by boldfacing either, because it looks at the overall shape of the character. Unfortunately, it cannot yet read proportional fonts, although there may be a new release shortly that will scan proportional print.

ACR was almost perfect on standard Courier and Prestige Elite sources. The only characters that fazed it at all were underlined characters with descenders. Accuracy with dot matrix input was variable. Normal 9-pin print was almost unreadable, 24-pin draft quality not much better, and 24-pin near letter quality not too bad. The program was able to decipher some characters in the Times Roman proportional source, which augurs well for future improvements in this area.

ACR ignores line drawing and boxing characters, which isn't all that big a deal. It usually does a good job of retaining indenting formatting in the original. As with other versions of *ReadRight* tested in PC Labs, *ACR* often inserts extra spaces in its scanned output for no apparent reason. It's not especially difficult to remove the extra spaces from normal text with the global replace feature in your word processor, but the extra spaces can mess up the results of scanning tabular sources. We had to do so much fiddling with our sample table once we imported it into *1-2-3* that we probably wouldn't bother in day-to-day use.

TESTING The Scan 300 acquitted itself well in our tests. It was slightly better on some scans than the other Microtek-based scanners PC Labs tested, slightly less accurate on others. The deviations were within the realm of sample-to-sample variations rather than showing any advantage or disadvantage for the Abaton unit.

Abaton's price of $3,195 includes the hardware, the *ACR* OCR software, and graphics-scanning software that wasn't ready yet. Other scanner vendors offer the Microtek engine for less than the $3,195 Abaton asks, and Abaton has several less-costly units based on Ricoh engines. On the other hand, Abaton is a solid company with a good track record in the scanning category. If you operate both PCs and Macs, the availability of solid software and workable interfaces in both camps might be a telling factor.—**Glenn A. Hart**

AST RESEARCH INC.

AST TurboScan

The $2,395 AST TurboScan is part of AST Research's Premium Publisher, a hardware/software compilation for desktop publishing. It uses Microtek's MS-300A scanning engine and *EyeStar* software, which can scan and process images at 300 dots per inch and which allows gray-scale image processing. The OCR package was not available at press time, but a demo disk confirmed that the OEM was OCR Systems, maker of the program for Microtek's original MS-300A system.

The hardware includes a half-slot parallel interface card that can be configured for software interrupts and DMA channels. The scanner has a 14- by 17- inch footprint and a removable cover for servicing, with a single-sheet feed at the front and an optional sheet feeder for OCR work. Pages, fed from the top, come out at the bottom nearly at a right angle, so you may need to elevate the scanner to keep artwork from curling. A door on the scanner's front opens for clearing paper jams.

EyeStar controls the scanner, allowing stored settings for line art or halftones, scale, windows, contrast, brightness, and grain. An image area can have up to four scanning windows, with originals scaled in 5 percent increments from 25 percent to 100 percent. *EyeStar* also includes an image editor that can crop, cut, paste, rotate, invert, or paint any image before it is stored on disk.

EXPERIMENTATION *EyeStar* is easy to use and invites experimentation. Line art scanned nicely, with only slight misalignment during a few scans and with excellent results even at 25 percent of the

The AST TurboScan comes equipped with a single-sheet feed at the front and a removable cover for servicing. Based on Microtek's MS-300A scanning engine, it has a half-slot parallel interface card that can be configured for software interrupts and DMA channels.

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■ The Overview system is optimized for on-screen viewing of scanned images rather than for desktop publishing functions.

original. The gray scale and photograph also scanned well, although my monitor's limitations prevented me from seeing how well until I converted the files to the *PC Paintbrush Plus* format. *EyeStar* also converts scanned and saved files to and from *PC Paint*, *GEM Paint*, and *WIPS*, and converts one way to the *CAD/camera* format. The convert utility unfortunately will not store default settings; I had to load my parameters every time I ran it. Otherwise, however, it does an excellent job of changing the image to the desired format.

Although the *EyeStar* graphics editor allows you to zoom in on an area, you cannot do fat-bit editing on individual pixels (though you can do this by converting the image file into the *PC Paintbrush Plus* format). You can edit small blocks using cut-and-paste, and can copy, rotate, and crop images before saving them to disk. *EyeStar* also lets you add lines, boxes, or shaded boxes to the scanned image. One nice feature is the ability to enlarge or reduce part of an image in a window and save that as a separate file. For example, I scanned the line art sample into a working file, saved the original, then selected an area with a window, enlarged it by a factor of 9 on both the *x* and *y* axes, and saved that image into a new file. Using this method, you can produce hundreds of enlarged or edited ancillary images from a single picture.

INTEGRATION TOOL Although AST is selling *PageMaker* with its publishing system, *EyeStar* also includes a text/graphics integration tool designed to place callable images into word processing files. This feature predates *PageMaker* but may be quicker to use if you need to wordwrap around an image with words in a few minutes. *EyeStar* has a menu for other DOS programs, too, so you can scan an image, edit it, size it, and then call up your word processor, enter the coordinates, rewrap your text, and print the whole thing.

The text/graphics integrator is similar to other products that predate desktop publishing. With *EyeStar* you edit the word processing file, make a hole for the picture, add an image marker that calls up the scanned graphic, then view or print the file. You must do all this from within *EyeStar*, which is not much of a hardship, although I would have liked to use the word processor to control the printing. If you don't have a fancy, PostScript-based publishing package, you'll probably find this feature very useful.

The TurboScan package included a demo of the OCR software, developed by OCR Systems and reviewed last year (see "Page-to-Disk Technology: Nine State-of-the-Art Scanners," *PC Magazine*, Volume 5 Number 16). Since I had only a demo, I won't comment on the software, except to say that it performs well enough and should prove an important addition to the package.

The AST TurboScan by itself is an excellent system, though it's a misnomer to call it an AST scanner. This machine is pure Microtek, from the hardware to the documentation; AST provides a marketable name and nothing else. To its credit, the company repackaged the technical manual. It did nothing, however, with the existing user manual, which is complete but needs a face-lift. There was no documentation describing how the AST TurboScan fits into the rest of AST's publishing system—but then, I haven't seen the whole package. One hopes they pull it all together somewhere.—**Tom Stanton**

FACT FILE

AST TurboScan
AST Research Inc.
2121 Alton Ave.
Irvine, CA 92714
(714) 863-1480

List Price: $2,395; *ReadRight*, $695.

Requires: 640K RAM (OCR requires 512K only); two disk drives.

Supports: Hercules monochrome graphics adapter, IBM CGA, IBM EGA, Micro Display Genius VHR; dot matrix and laser printers; Microsoft-compatible mice.

In Short: A fine scanning system manufactured by Microtek and resold under the AST name as part of that company's desktop publishing system. Scanning software includes a useful text-graphics integrator.

CIRCLE **641** ON READER SERVICE CARD

AT&T

AT&T Overview Scanner

The $2,000 AT&T Overview Scanner stands apart from the others reviewed here—in design, in operation, and in purpose. It's not really aimed at desktop publishing applications. Instead, with its *Scanware* software, the Overview is the cornerstone of a teleconferencing system that combines simplicity, flexibility, and utility. It's an impressive arrangement that could find applications in many businesses.

OVERHEAD PROJECTOR Unlike ordinary flatbed or roller-feed scanners, the Overview looks like an overhead projector. It has a flat scan bed that can accommodate objects up to 8 by 10 inches in area and up to 1 inch thick, making it suitable for scanning objects such as books or even printed circuit boards. Two fluorescent lamps illuminate the scan bed. Ten inches above the bed, an array of photosensitive devices in the scanner head, focusing through a lens, moves across the material to be scanned. The whole thing plugs into your PC through a standard 25-pin D-connector on a half-slot interface board. The board has another port for an AT&T Audiographic Remote Controller that you can use to manage a presentation.

The system's software includes AT&T's *Scanware* and Z-Soft's *PC Paintbrush Plus*. *Scanware* uses the Overview unit to scan and capture pictures, but *Scanware* does much more than that. It can transmit pictures to other locations, either automatically or with a command. It can display pictures created with *PC Paintbrush* or other programs. It can set up or receive conference calls with one or many

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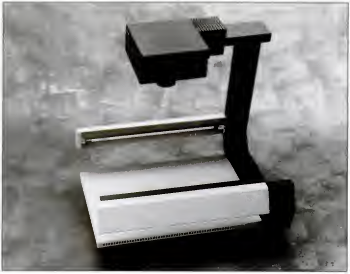

The AT&T Overview Scanner resembles a typical overhead projector. Two fluorescent lamps mounted on the top of the machine illuminate a flatbed from which three-dimensional objects measuring up to 1 by 8 by 10 inches (HWD) in area can be scanned.

other PCs. It can create slide shows that have fades, rolls, spirals, diagonals, and other fancy transitions. It can even transmit individual pictures or slide shows in advance of the presentation.

For multi-PC connections, AT&T offers an internal, 4,800-baud synchronous modem board; you can use a normal asynchronous modem for communications between only two PCs. Several AT&T services are available for complex teleconferencing, including Alliance for up to 59 locations, the Quorum Teleconferencing Bridge for up to 14 audio-visual locations, and the Quorum Teleclass Bridge for up to 10 A/V links. In addition, you can incorporate digitizing tablets, printers, large display screens, and projectors into the system.

ROUGH EDGES The Overview system we reviewed was a prototype with beta software. We don't normally evaluate products before their release, but this was so unusual and interesting that we made an exception. Since it was a beta version, the software had a number of rough edges that should be ironed out by the time the product reaches its final form (roughly when this article appears in print).

AT&T lent us one of its 6300 Plus computers, with a 600- by 400-line mono DEB video system in place and with the Overview's interface and software preinstalled. This was done partly to ease our review but mainly because all the necessary drivers aren't ready for using the system with your PC and EGA or VGA card (evidently the only alternatives AT&T plans to support). The Overview driver for *PC Paintbrush Plus* wasn't ready, so we had to scan with *Scanware,* save in the *Paintbrush* format, and read the images into *Paintbrush* separately. The correct driver, which will be ready when the system is released, should make the Overview more powerful and convenient.

Scanware uses a simple, horizontal-bar menu system with drop-down windows; it's so intuitive that it requires little reference to the detailed manual. You use either function keys or a mouse to select commands, most of which operate in real-time for use during on-line conferences. *Scanware* lets you scan, send, load predefined slide shows, sequence to the next or previous slide, and print. You can also adjust the size of the image to be scanned (either 5 by 8 or 8 by 10 inches), select scanning modes, specify color or black-and-white annotation, set text size, and more.

PITCH BLACK Our first scan attempt gave us pitch-black output, but once we removed the lens cap things got better. The Overview system is optimized for on-screen viewing of scanned images rather than for laser printing or desktop publishing functions; its resolution is only 80 dots per inch (dpi) instead of the 300 dpi of most scanners. That's fine for EGA and VGA screens, of course, but on paper there are some shortcomings.

The scans of our test line art, for example, were uneven, with some areas showing up lighter than others—apparently a function of the illumination system. Scans of the test photograph and gray scale were truly unattractive. You can improve the results somewhat by fiddling with contrast and brightness settings, but the beta software wasn't really up to par yet. We also tried scanning a printed circuit board. Though the resulting image looked okay and might have been adequate for a presentation, it wasn't good enough for critical documentation or publishing uses. A special driver to be provided with the re-

(continues)

PC MAGAZINE FACT FILE

AT&T Overview Scanner
AT&T
185 Monmouth Pkwy.
West Long Branch, NJ 07764
(800) 227-6161
List Price: $2,000; interface card, $300, *Scanware* and *PC Paintbrush Plus,* $750.
Requires: 640K RAM, hard disk drive, 4,800-bps synchronous modem board for point-to-point communications, internal modem for multipoint communications.
Supports: IBM EGA and compatibles, IBM VGA, Sigma VGA, STB-Systems VGA, AT&T DEB (for AT&T PCs only); Microsoft-compatible mice.
In Short: An impressive system for scanning images and integrating them into multiple-location teleconferences.

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Master Piece ($149.95) and Master Piece Plus ($159.95). For more info, or a dealer near you, call (800) 535-4242. In NY (212) 475-5200.

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CIRCLE 272 ON READER SERVICE CARD

Summary of Features: Graphics and OCR Scanners

(Products listed in ascending price order)

	Canon IX-12 Image Scanner Canon USA Inc.	**The Laser Scanner Model LS-300** Princeton Graphic Systems	**Datacopy JetReader** Datacopy Corp.	**Crystal Scan Image Scanner Model 3001** Taxan Corp.	**Microtek MS-300C** Microtek Lab Inc.	**Datacopy 730** Datacopy Corp.
List price	$945	$1,095	$1,300	$1,695	$1,795	$1,800
HARDWARE						
Overall dimensions, incl. paper feed (H×W×D in inches)	2.83×13.66 ×11.61	3.5×13.5 ×11.5	5.5×15.75 ×13	11.5×14.5 ×17	11×14.75 ×16.5	5.5×14.75 ×19
Footprint (W×D in inches)	13.66×11.61	13.5×11.5	15.5×10	14.5×17	11×16.5	13.5×18.5
Panel controls	N/A	N/A	Contrast	N/A	N/A	Contrast
Scan area	Platen feed	Platen feed	Platen feed	Platen feed	Platen feed	Flatbed
Paper handling						
Paper path	Straight roller	Straight roller	Straight roller	S-curve roller	Straight roller	Flatbed
Paper feed (max. no. of pages)	Sheet feeder (5)	Single sheet	Sheet feeder (10)	Single sheet	Single sheet	Single sheet
Page size (inches)						
Min. length	3	3	4.25	3	3	No minimum
Min. width	3	5	5.75	.5	3	No minimum
Max. length	14	14	14.25	14	14	14
Max. width	11	11	10	8.5	8.5	8.5
Paper thickness (inches)						
Min. thickness of original	.002	.018	.018	.011	No minimum	No minimum
Max. thickness of original	.007	.035	.032	.08	.012	No maximum
Max. skew	.25	N/A	<.25	N/A	.25	<.25
Interface						
Slot size	Full	Half	Half	Half	Half	Half
Type of interface	Proprietary	Proprietary	Proprietary	Proprietary	Proprietary	Proprietary
Interrupts	Switched	Switched	N/A	N/A	N/A	N/A
DMA channel	N/A	Switched	Switched	Switched	Switched	Switched
Input/output hex address	Switched	Switched	Switched	Switched	Switched	Switched
SOFTWARE						
Calls other software from within package	●	○	●	○	○	○
Documentation						
No. of pages	27	200	247	185	308	247
Quick-start chapter	●	●	○	○	●	○
Paper tutorial	○	○	●	○	●	●
On-line tutorial	○	○	○	○	○	○

●—Yes ○—No

N/A—Not applicable; feature not available in this model.

	Canon IX-12 Image Scanner Canon USA Inc.	**The Laser Scanner Model LS-300** Princeton Graphic Systems	**Datacopy JetReader** Datacopy Corp.	**Crystal Scan Image Scanner Model 300i** Taxan Corp.	**Microtek MS-300C** Microtek Lab Inc.	**Datacopy 730** Datacopy Corp.
SCANNER FEATURES						
Settings	Brightness	Brightness	Contrast, brightness	Density, contrast, brightness	Contrast, brightness	Density
Graphics type	Line art (B&W), continuous tone	Line art (B&W), continuous tone	Line art (B&W), continuous tone	Line art (B&W), continuous tone	Line art (B&W), continuous tone	Line art (B&W), continuous tone
Modes	Line art (B&W), dither	Line art (B&W), dither	Line art (B&W), dither	Line art (B&W), dither	Line art (B&W), halftoning	Line art (B&W), dither
Resolution (dots per inch)	200, 300	75, 150, 200, 300	150, 200, 240, 300, 300 × 300, 240×240, 200×200, 100×80	75, 100, 150, 180, 200, 240, 300	75, 100, 150, 200, 240, 300	150, 200, 240, 300
Scan area						
Fixed	○	○	○	○	○	○
Adjustable	●	●	●	●	●	●
Max. no. of windows	1	1	1	Infinite (20 is normal)	4	1
Scan interface						
Proprietary software	○	○	●	●	●	●
Works with paint program	●	●	●	○	○	●
Paint program included	○	●	●	○	○	●
Editing mode						
Writes to disk before editing	●	●	●	●	●	●
Preview mode (edit, then save)	●	●	●	●	●	●
Editing features in scanner menu						
Crop—scales from (percent)	N/A	N/A	N/A	25	25	N/A
Crop—scales to (percent)	N/A	N/A	N/A	100	100	N/A
Scale x-axis from (percent)	N/A	N/A	N/A	25	25	N/A
Scale x-axis to (percent)	N/A	N/A	N/A	100	100	N/A
Scale y-axis from (percent)	N/A	N/A	N/A	25	25	N/A
Scale y-axis to (percent)	N/A	N/A	N/A	100	100	N/A
Rotates from (degrees)	N/A	N/A	0	0	N/A	0
Rotates to (degrees)	N/A	N/A	360	360	N/A	360
Increments of rotation (degrees)	N/A	N/A	90	45	N/A	90
Inverts image (top to bottom)	●	●	●	●	●	●
Flops image (left to right)	●	●	●	●	●	●
Mark	●	●	●	●	●	●
Copy	●	●	●	●	●	●
Cut	●	●	●	●	●	●
Paste	●	●	●	●	●	●
Move	●	●	●	●	●	●
Paint	●	●	●	●	●	●
Lines	●	●	●	●	●	●
Palette	●	●	●	●	●	●
Print window	●	●	●	●	●	●
Print file	●	●	●	●	●	●
Other	○	○	○	○	●	○
Filing						
Compression available	○	○	●	●	●	●
Format	.PCX, .PIC	.PCX	TIFF, .PCX, .IMG	TIFF, .PCX, .PIC	TIFF, .PCX, .MSP	TIFF, .PCX, .IMG

Summary of Features: Graphics and OCR Scanners

(Products listed in ascending price order)

	Canon IX-12 Image Scanner Canon USA Inc.	The Laser Scanner Model LS-300 Princeton Graphic Systems	Datacopy JetReader Datacopy Corp.	Crystal Scan Image Scanner Model 300I Taxan Corp.	Microtek MS-300C Microtek Lab Inc.	Datacopy 730 Datacopy Corp.
OCR FEATURES						
Settings	Contrast	Brightness	Contrast	Density, contrast, brightness	Density, contrast, brightness	Contrast
OCR scan areas	Partial page	Partial page	Partial page	Partial page	Partial page	Partial page
Programmable margins from (in inches)	N/A	3×3	N/A	N/A	.25	.25
Programmable margins to (in inches)	N/A	8×14	N/A	11	10.5	10.5
Max. no. of windows	1	1	1	1	1	1
OCR interface						
Proprietary software	●	●	○	●	●	○
WP/editor program	○	○	○	○	○	○
Other	○	○	ASCII	○	○	ASCII
RECOGNITION						
Fonts						
ANSI OCR-B	●	○	●	●	○	●
ANSI OCR-C	○	○	○	○	○	○
Courier 10	●	●	●	●	●	●
Courier 12	●	○	●	●	●	●
Courier 15	○	○	○	●	●	○
Courier 72	○	○	○	●	●	○
Elite 12	●	●	●	●	●	●
Gothic 15	●	○	○	○	●	○
Letter Gothic	●	●	○	●	●	○
OCR-A	●	○	●	○	●	●
OCR-B	●	●	●	○	●	●
OCR-C	○	○	○	○	○	○
Prestige Pica 10	●	●	●	●	●	●
Prestige Elite 12	●	●	●	●	●	●
Titan 10	●	○	○	○	●	○
Titan 12	○	○	○	○	●	○
Near-letter-quality dot matrix	● (Epson, IBM)	○	● (Epson)	○	● (Epson)	● (Epson)
Dot matrix	○	○	● (Epson)	○	○	● (Epson)
Font size (points)	10, 12, 15	10, 12	10–18 (in any increment)	6, 8, 10, 12	10–15 (in any increment)	10–18 (in any increment)

● — Yes ○ — No

N/A—Not applicable; does not have this feature.

	Canon IX-12 Image Scanner Canon USA Inc.	**The Laser Scanner Model LS-300** Princeton Graphic Systems	**Datacopy JetReader** Datacopy Corp.	**Crystal Scan Image Scanner Model 300I** Taxan Corp.	**Microtek MS-300C** Microtek Lab Inc.	**Datacopy 730** Datacopy Corp.
Highlights						
Regular	●	●	●	●	●	●
Boldface	●	●	●	●	●	●
Underline	○	○	●	●	●	●
Italic	●	○	●	○	●	●
Double-strike	●	●	●	●	●	●
Double density (shadow print)	○	●	●	○	●	●
Other	None	None	Sub/superscript	None	None	Sub/superscript
Page formatting						
Blank lines	●	●	●	●	●	●
Paragraphs	●	○	●	●	●	●
Indents	●	○	●	●	●	●
Tabs	○	●	●	●	●	●
Page breaks	●	○	●	○	●	●
Programmable page formatting						
Carriage return	○	○	●	○	●	●
Carriage return/line feed	○	○	●	○	●	●
Hard returns	○	○	●	○	●	●
Soft returns	○	○	●	○	●	●
Spaces to tabs	○	○	●	○	●	●
Spaces to programmable	○	○	○	○	●	○
Paragraph markers	○	○	●	○	●	●
Page breaks	○	○	●	○	●	●
Other	None	None	None	None	None	None
Window	○	○	○	○	○	○
Features						
Loads fonts automatically	●	○	●	○	●	●
Ignores lines or rules on the page	●	○	●	●	●	●
Ignores graphics on the page	○	○	○	○	●	○
Flags unread characters	○	○	●	○	●	●
Has user-definable flag	○	●	●	○	○	●
Lets user intervene with unread characters	○	●	●	○	○	●
Scans multiple documents into one file	●	●	●	●	●	●
Uses a spelling checker during recognition	○	○	○	○	○	○
Has user-definable dictionary or lexicon	○	○	○	○	○	○
Allows automatic text formatting	●	○	●	●	●	●
Formats before saving file	○	○	●	○	●	●
Offers 7- and/or 8-bit recognition	●	○	○	●	●	○
OCR file formats						
ASCII text file	●	●	●	●	●	●
DCA (document content architecture)	●	○	○	○	●	○
Other	None	None	None	None	None	None

Summary of Features: Graphics and OCR Scanners

(Products listed in ascending price order)

	PC **Microtek MSF-300C** Microtek Lab Inc.	PC **Dest PC Scan Plus** Dest Corp.	**EIT Personal Scanner 2000** EIT Inc.	**Microtek MS-300A** Microtek Lab Inc.	**CompuScan PCS PageReader** CompuScan Inc.	**IOC Reader Model 400** Intelligent Optics Corp.	PC **Kurzweil Discover 7320** Kurzweil Computer Products
List price	$1,995	$2,495	$2,495	$2,495	$3,495	$3,495	$9,950
HARDWARE							
Overall dimensions, incl. paper feed (H×W×D in inches)	5.5×15.75 ×24	4×18 ×11.5	10.8×13 × 13	11×14.75 ×18.5	8×17×19	10×14 ×14.5	3.5×15.5 ×10.5
Footprint (W×D in inches)	14.75×23	18×11.5	13×13	11×16.5	17×31	14×10.5	15.5×10.5
Panel controls	N/A	N/A	Contrast	N/A	N/A	N/A	Brightness
Scan area	Flatbed	Platen feed	Platen feed	Platen feed	Platen feed	Platen feed	Platen feed
Paper handling							
Paper path	Flatbed	Semicircular roller	Curved bed	Straight roller	Curved roller	Curved roller	Straight roller
Paper feed (max. no. of pages)	Single sheet	Single sheet	Single sheet	Single sheet	Bin feed (50)	Bin feed (30)	Bin feed (50)
Page size (inches)							
Min. length	No minimum	3.5	2	3	3	No minimum	3.5
Min. width	No minimum	3.5	3.5	3	5	8	3.5
Max. length	14	14	14	14	8.5	11	14
Max. width	8.5	8.5	8.5	8.5	14	8.5	8.5
Paper thickness (inches)							
Min. thickness of original	No minimum	.018	No minimum	No minimum	.011	.018	.018
Max. thickness of original	No maximum	.026	.021	.012	.026	.06	.035
Max. skew	.25	.25	<.1	.25	N/A	.17	.5
Interface							
Slot size	Half	Half	Half	Half	Half	N/A	Full
Type of interface	Proprietary	Proprietary	Proprietary	Proprietary	Parallel	Serial	Proprietary
Interrupts	N/A	Switched	Switched	N/A	N/A	Serial	Switched
DMA channel	Switched	Switched	Switched	Switched	N/A	Serial	Switched
Input/output hex address	Switched	Switched	Switched	Switched	Switched	Serial	Switched
SOFTWARE							
Calls other software from within package	○	○	●	○	○	●	●
Documentation							
No. of pages	308	110	135	308	325	169	80
Quick-start chapter	●	●	○	●	●	●	●
Paper tutorial	●	●	○	●	●	○	●
On-line tutorial	○	○	○	○	○	○	○

●—Yes ○—No

PC—Indicates Editor's Choice

N/A—Not applicable: feature not available in this model.

	Microtek MSF-300C Microtek Lab Inc.	**Dest PC Scan Plus** Dest Corp.	**EIT Personal Scanner 2000** EIT Inc.	**Microtek MS-300A** Microtek Lab Inc.	**CompuScan PCS PageReader** CompuScan Inc.	**IOC Reader Model 400** Intelligent Optics Corp.	**Kurzweil Discover 7320** Kurzweil Computer Products
SCANNER FEATURES							
Settings	Contrast, brightness	Brightness	Contrast	Contrast, brightness	Contrast	Density, contrast, brightness	Contrast
Graphics type	Line art (B&W), continuous tone	Line art (B&W), continuous tone	Line art (B&W)	Line art (B&W), continuous tone	Line art (B&W)	Line art (B&W)	Line art (B&W), continuous tone
Modes	Line art (B&W), halftoning	Line art (B&W), dither	Line art (B&W)	Line art (B&W), halftoning	Line art (B&W)	Line art (B&W), dither	Line art (B&W), dither
Resolution (dots per inch)	75, 100, 150, 180, 200, 240, 300	200, 240, 300	200, 240, or 300	300	25–200	200, 300, 400	180, 200, 240, 300
Scan area							
Fixed	○	○	○	○	○	○	●
Adjustable	●	●	●	●	●	●	○
Max. no. of windows	1	1	1	4	1	1	1
Scan interface							
Proprietary software	●	●	●	●	●	●	●
Works with paint program	○	●	○	○	○	●	○
Paint program included	○	●	○	○	○	●	○
Editing mode							
Writes to disk before editing	●	○	●	●	●	●	●
Preview mode (edit, then save)	●	●	○	●	●	○	○
Editing features in scanner menu							
Crop—scales from (percent)	25	25	0	25	N/A	N/A	N/A
Crop—scales to (percent)	100	100	100	100	N/A	N/A	N/A
Scale x-axis from (percent)	25	N/A	0	25	100	25	N/A
Scale x-axis to (percent)	100	N/A	100	100	900	400	N/A
Scale y-axis from (percent)	25	N/A	0	25	100	25	N/A
Scale y-axis to (percent)	100	N/A	100	100	900	400	N/A
Rotates from (degrees)	N/A	N/A	N/A	N/A	0	0	N/A
Rotates to (degrees)	N/A	N/A	N/A	N/A	360	360	N/A
Increments of rotation (degrees)	N/A	N/A	N/A	N/A	90	90	N/A
Inverts image (top to bottom)	●	●	○	●	●	●	○
Flops image (left to right)	●	●	○	●	●	●	○
Mark	●	●	○	●	●	●	○
Copy	●	●	○	●	●	●	○
Cut	●	●	○	●	●	●	○
Paste	●	●	○	●	●	●	○
Move	●	●	○	●	●	●	○
Paint	●	●	○	●	●	●	○
Lines	●	●	○	●	●	●	○
Palette	●	●	○	●	●	●	○
Print window	●	●	●	●	○	●	○
Print file	●	●	●	●	●	●	○
Other	○	●	○	●	○	●	○
Filing							
Compression available	●	●	●	●	○	○	○
Format	TIFF, .PCX, .MSP, .IMG	TIFF, .PCX	.PCX	TIFF, .PCX, .MSP, .IMG	TIFF, .PIC, .MSP, *GEM Paint*	TIFF, .PCX, .CAM	TIFF, .PCX, .RES

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- 200WT POWER SUPPLY
- EIGHT EXPANSION SLOTS
- ONE 1.2MB FLOPPY DRIVE
- ENHANCED KEYBOARD
- OPERATIONS MANUAL
- ONE YEAR WARRANTY

$1195

BASE SYSTEM

20MB (65ms) $1495
40MB (39ms) $1695
60MB (23ms) $2095

FIVESTAR 286/10

- IBM COMPATIBLE
- 640K MEMORY
- INTEL 80286 CPU
- DUAL SPEED 6/10MHz
- NORTON SI RATING 10.3
- 200WT POWER SUPPLY
- EIGHT EXPANSION SLOTS
- ONE 1.2MB FLOPPY DRIVE
- ENHANCED KEYBOARD
- OPERATIONS MANUAL
- ONE YEAR WARRANTY

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BASE SYSTEM

20MB (65ms) $1295
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CIRCLE 386 ON READER SERVICE CARD

Summary of Features: Graphics and OCR Scanners

(Products listed in ascending price order)

	PC Microtek MSF-300C Microtek Lab Inc.	PC Dest PC Scan Plus Dest Corp.	EIT Personal Scanner 2000 EIT Inc.	Microtek MS-300A Microtek Lab Inc	CompuScan PCS PageReader CompuScan Inc.	IOC Reader Model 400 Intelligent Optics Corp.	PC Kurzweil Discover 7320 Kurzweil Computer Products
OCR FEATURES							
Settings	Density, contrast, brightness	Brightness	Contrast	Density, contrast, brightness	Contrast	None	Contrast
OCR scan areas	Partial page	Full page only	Full page only	Partial page	Partial page	Partial page	Partial page
Programmable margins from (in inches)	.25	None	.2 from edge	.25	.2	0	.01
Programmable margins to (in inches)	10.5	None	.2 from edge	10.5	14	14	8
Max. no. of windows	1	1	1	1	1	1	1
OCR interface							
Proprietary software	●	●	●	●	●	●	●
WP/editor program	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○
RECOGNITION							
Fonts							
ANSI OCR-B	○	●	○	○	●	○	○
ANSI OCR-C	○	○	○	○	○	○	○
Courier 10	●	●	●	●	●	●	●
Courier 12	●	●	○	●	●	●	●
Courier 15	●	○	○	●	○	○	●
Courier 72	●	●	○	●	○	○	●
Elite 12	●	●	○	●	●	○	●
Gothic 15	●	●	○	●	○	○	●
Letter Gothic	●	●	○	●	●	●	●
OCR-A	●	○	●	●	●	●	●
OCR-B	●	●	●	●	●	●	●
OCR-C	●	○	○	○	○	○	●
Prestige Pica 10	●	●	●	●	●	●	●
Prestige Elite 12	●	●	●	●	●	●	●
Titan 10	●	○	○	●	●	○	●
Titan 12	●	○	○	●	○	○	●
Near-letter-quality dot matrix	○	● (Epson, Okidata, IBM)	● (Epson)	● (Epson)	● (Epson, Okidata)	● (Cordata, Epson, Hewlett-Packard)	○
Dot matrix	○	● (Epson, Okidata, IBM)	○	○	○	● (Epson, Okidata, IBM)	○
Font size (points)	10–15 (in any increment)	10, 12	10, 12	10–15 (in any increment)	10, 12	10, 12	8, 10, 12

● — Yes ○ — No

PC —Indicates Editor's Choice

N/A—Not applicable: feature not available in this model.

	Microtek MSF-300C Microtek Lab Inc.	**Oest PC Scan Plus** Dest Corp.	**EIT Personal Scanner 2000** EIT Inc.	**Microtek MS-300A** Microtek Lab Inc.	**CompuScan PCS PageReader** CompuScan Inc.	**IOC Reader Model 400** Intelligent Optics Corp.	**Kurzweil Discover 7320** Kurzweil Computer Products
Highlights							
Regular	●	●	●	●	●	●	●
Boldface	●	●	○	●	●	○	●
Underline	●	○	○	●	●	○	○
Italic	●	○	○	●	○	○	●
Double-strike	●	●	○	●	●	○	●
Double density (shadow print)	●	●	○	●	○	○	●
Other	None	None	None	None	Sub/superscript	None	None
Page formatting							
Blank lines	●	●	●	●	●	●	●
Paragraphs	●	●	●	●	●	●	●
Indents	●	●	●	●	○	●	●
Tabs	●	●	●	●	○	●	●
Page breaks	●	●	●	●	●	●	●
Programmable page formatting							
Carriage return	●	○	●	●	○	●	●
Carriage return/line feed	●	○	●	●	●	●	●
Hard returns	●	○	●	●	○	●	●
Soft returns	●	○	●	●	○	●	●
Spaces to tabs	●	○	●	●	○	●	●
Spaces to programmable	●	○	●	●	○	○	●
Paragraph markers	●	○	●	●	○	●	●
Page breaks	●	○	●	●	○	●	●
Other	None	None	None	None	None	None	None
Window	○	○	○	○	○	○	○
Features							
Loads fonts automatically	●	●	●	●	●	●	●
Ignores lines or rules on the page	●	●	○	●	●	○	●
Ignores graphics on the page	●	●	●	●	○	○	●
Flags unread characters	●	●	●	●	●	●	●
Has user-definable flag	○	○	○	○	●	●	●
Lets user intervene with unread characters	○	○	○	○	○	○	○
Scans multiple documents into one file	●	●	●	●	●	●	●
Uses a spelling checker during recognition	○	○	○	○	○	○	○
Has user-definable dictionary or lexicon	○	○	○	○	○	○	●
Allows automatic text formatting	●	●	●	●	○	●	●
Formats before saving file	●	○	○	●	○	○	●
Offers 7- and/or 8-bit recognition	●	●	●	●	○	●	●
OCR file formats							
ASCII text file	●	●	●	●	●	●	●
DCA (document content architecture)	●	●	○	●	●	●	●
Other	None	None	None	None	None	None	None

Summary of Features: Graphics-Only Scanners

(Products listed in ascending price order)

	PixiScanner Micro Technologies	**CAT Image Scanner** Computer Aided Technology Inc.	**Epson Image Scanner Option Kit** Epson America Inc.	**ShapeScan SS-300** Shape Inc.	**TLC IS-300** The Laser Connection	**IBM 3117 Scanner** IBM Corp.
List price	$269.00	$295.00	$299.95	$795.00	$895.00	$1,095.00
HARDWARE						
Overall dimensions, incl. paper feed (H×W×D in inches)	1.5×3.75×2.5	1×5.5×4.5	2.4×2.5×3.7	10.5×13×13.5	7.5×13.5×18	5×15×15.5 (plus 11-inch overtravel of tray)
Footprint (W×D in inches)	Fits on printhead	5×4	Fits on printhead	13×13.5	13.5×11.5	15×15.5
Panel controls	None	Contrast	None	Brightness	None	None
Scan area	Platen feed (provided by printer)	Platen feed (provided by printer)	Platen feed (provided by printer)	Flatbed	Platen feed	Flatbed
Paper handling						
Paper path	Curved roller (provided by printer)	Curved roller (provided by printer)	Curved roller (provided by printer)	Semicircular bed	Straight roller	Flatbed
Paper feed (max. no. of pages)	Depends on printer	Depends on printer	Depends on printer	Single sheet	Sheet feeder (5)	Single sheet
Page size (inches)						
Min. length	No minimum	No minimum	No minimum	3	3.5	No minimum
Min. width	No minimum	3	No minimum	3	2	No minimum
Max. length	11	8.5	8	14	24	11
Max. width	8.5	12	11	8	9	8.5
Paper thickness (inches)						
Min. thickness of original	Depends on printer	No minimum	Depends on printer	No minimum	.002	No minimum
Max. thickness of original	Depends on printer	Depends on printer	Depends on printer	No maximum	.007	No maximum
Max. skew	Depends on printer	Depends on printer	N/A	N/A	N/A	N/A
Interface						
Slot size	N/A	N/A	N/A	Half	Full	Full
Type of interface	Serial	Parallel	Serial	Proprietary	Proprietary	Proprietary
Interrupts	Serial	Parallel	Serial	Fixed	Switched	Fixed
DMA channel	Serial	Parallel	Serial	Fixed	Fixed	N/A
Input/output hex address	Serial	Parallel	Serial	Switched	Switched	N/A
SOFTWARE						
Calls other software from within package	○	○	○	○	○	○
Documentation						
No. of pages	60	70	40	35	34	380
Quick-start chapter	●	○	○	○	●	○
Paper tutorial	○	○	○	○	●	●(for *ImegEdit* only)
On-line tutorial	○	○	○	○	○	○

●—Yes ○—No

N/A—Not applicable: does not have this feature.

*OCR software not available at press time.

	PixiScanner Micro Technologies	**CAT Image Scanner** Computer Aided Technology Inc.	**Epson Image Scanner Option Kit** Epson America Inc.	**ShapeScan SS-300** Shape Inc.	**TLC IS-300** The Laser Connection	**IBM 3117 Scanner** IBM Corp.
SCANNER FEATURES						
Settings	Density, contrast	Contrast	Contrast, brightness	Brightness	Density, contrast, brightness	Contrast, brightness
Graphics type	Line art (B&W), continuous tone	Line art (B&W), continuous tone	Line art (B&W), continuous tone	Line art (B&W)	Line art (B&W), continuous tone	Line art (B&W)
Modes	Dither	Line art (B&W), dither	Dither	Line art (B&W)	Line art (B&W), dither	Line art (B&W), dither
Resolution (dots per inch)	640 (horizontal) 72–216 (vertical)	50–300 (horizontal) 54, 72, 144, 216 (vertical)	60, 90, 180	100, 200, 240	75×75, 150×150, 200×200, 300×300	120×120, 240×120, 240×240
Scan area						
Fixed	○	●	○	○	○	● (under IDU)
Adjustable	●	○	●	●	●	● (under *ImagEdit*)
Max. no. of windows	1	1	1	1	1	1
Scan interface						
Proprietary software	●	●	●	○	○	●
Works with paint program	○	○	○	●	●	○
Paint program included	○	○	○	●	○	○
Editing mode						
Writes to disk before editing	●	○	●	●	●	○
Preview mode (edit, then save)	●	○	●	○	●	○
Editing features in scanner menu						
Crop—scales from (percent)	N/A	N/A	Unlimited	N/A	N/A	N/A
Crop—scales to (percent)	N/A	N/A	Unlimited	N/A	N/A	N/A
Scale x-axis from (percent)	N/A	N/A	N/A	N/A	N/A	33
Scale x-axis to (percent)	N/A	N/A	N/A	N/A	N/A	300
Scale y-axis from (percent)	N/A	N/A	N/A	N/A	N/A	33
Scale y-axis to (percent)	N/A	N/A	N/A	N/A	N/A	300
Rotates from (degrees)	N/A	N/A	0	N/A	N/A	0
Rotates to (degrees)	N/A	N/A	270	N/A	N/A	360
Increments of rotation (degrees)	N/A	N/A	90	N/A	N/A	90
Inverts image (top to bottom)	●	○	●	●	●	●
Flops image (left to right)	○	○	●	●	●	●
Mark	○	○	○	●	○	●
Copy	○	○	●	●	○	●
Cut	○	○	●	●	○	●
Paste	○	○	●	●	○	●
Move	○	○	●	●	○	●
Paint	○	○	○	●	○	●
Lines	○	○	●	●	○	●
Palette	○	○	○	●	○	○
Print window	○	○	○	●	○	○
Print file	●	○	●	●	●	●
Other	○	○	○	○	○	●
Filing						
Compression available	○	○	○	○	○	○
Format	MSP, Run Length Encoded, ColorMac, MacPaint, ReadMac, Extended ColorMac	.PCX, .PCX Laser	.PIX	.PCX	.PCX	TIFF, .IDS, Scanmaster 8815, DCA/RFT document format, document data stream, BASIC image format

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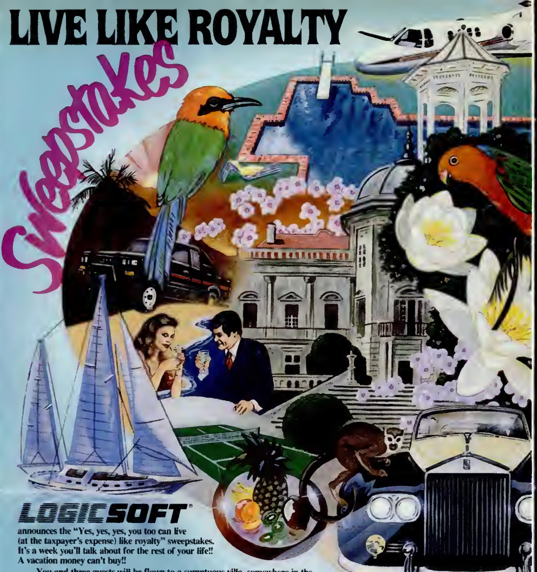

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Evercom 2400B Int.	$119
HAYES	
Smartmodem 1200	$299
Smartmodem 1200B w/Smartcom II	$299
Smartmodem 2400	$449
Smartmodem 2400B w/Smartcom II	$449
LOGICSOFT	
★1200	$129
★1200B	$69
★2400	$229
★2400B	$159
MIGENT	
Pocket Modem	$169
PROMETHEUS	
Pro-modem 1200	$215
Pro-modem 1200B	$145
TOSHIBA	
1200B Laptop Modem (T1100 Plus)	$299
VEN-TEL	
1200 Plus	$249
PC Modem 2400B	$415
ZENITH	
1200B Laptop Modem	$299

MOUSE INPUT DEVICES

MOUSE SYSTEMS	
PC Mouse w/Dr. Halo 2	$99
MICROSOFT	
Microsoft Mouse (Serial)	$129
Microsoft Mouse (Buss)	$119

SURGE PROTECTORS

CURTIS	
Diamond	$29
Ruby	$59
KENSINGTON MICROWARE	
Masterpiece	$95
Masterpiece Plus	$119
LOGICSOFT	
★Spike Bar	$25
★Spike Block	$19
NETWORX	
Power Mouse	$119
TRIPPLITE	
Isobar 8-15	$65
Isobar 8-15 w/RM	$69

KEYBOARDS

KEYTRONIC	
5151 (Deluxe)	$159
KB 101-1	$112

MEMORY STORAGE

IOMEGA	
Bernoulli Box (10+10)	$1449
Bernoulli Box (20 Mb)	$1299
Bernoulli Box (20+20)	$1899
Bernoulli 10 Mb Cartdg. Tr	$169
Bernoulli 20 Mb. Cartd. Tr	$255

HARD DISK DRIVES

MOUNTAIN COMPUTER	
Hard Drive Card (20Mb)	$499
Hard Drive Card (30Mb)	$579
MINISCRIBE Complete Line	LOWEST PRICE CALL
PLUS	
Hard Card 20 Mb	$649
Hard Card 40 Mb	$949
SEAGATE	
20 Mb H/Ht (ST225)	$329
20 Mb F/Ht (ST4026)	$539
30 Mb H/Ht (ST238)	$379
30 Mb F/Ht (ST4038)	$549
40 Mb H/Ht (ST251)	$559
40 Mb F/Ht (ST4051)	$659
80 Mb F/Ht (ST4096)	$895

CARTRIDGE TAPE BACK-UP

SYSGEN	
Image Tape Backup 20 Mb Int	$599
Image Tape Backup 20 Mb Ext	$699
TECMAR	
QIC 60 AT (Int.)	$1250
QIC 60 Ext Tape Backup	$1569
QIC Host Adapter Card	$125
FLOPPY DISC DRIVES	
Panasonic 360K ½ Ht	$109
Tandon TM-100 360K ½ Ht	$99
Toshiba 360K ½ Ht.	$109
Toshiba Ext 5.25 360K Drive	$389

BACK UP POWER SUPPLIES

DATASHIELD	
200 Wt (PC)	$249
300 Wt (XT)	$389
500 Wt (AT)	$565
800 Wt (AT)	$619
LOGICSOFT	
325 Wt	$305
450 Wt	$385
657 Wt	$549
1000 Wt	$819

★

LOGICSOFT CUSTOMER SERVICES

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If you are dissatisfied with your order, simply call for an RA# for a full refund of product purchase price, replacement, or credit within 30 days of receipt of order. Product must be undamaged in original package and contain all documentation and its unexecuted warranty card. (Due to certain mfg. copyright restrictions, some items may not apply.)

5 Year Unconditional Warranty On ★ items

Look for the ★ items, it identifies our Logic line of products. They are fully compatible with, but priced well below, the major manufacturers, and carry our 5 year replace or repair warranty. (You save—not by our use of inexpensive labor and parts—but through the state-of-the-art technology.)

Same Day Shipping

We carry a full stock of the most popular products—so we can ship the same day to get your order to you fast.

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We carry only the latest versions available and guarantee to ship the version quoted to you.

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One on-line mainframe allows instant access to customer and product information.

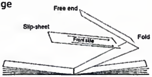
CIRCLE 395 ON READER SERVICE CARD

Folded edge of the page

GbsSlipSheet-001

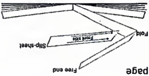
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
    1. Front side touching the free page
    2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
    1. Front side touching the free page
    2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



NEY-BACK G

And your chance to live like royalty!

Ohh, my, my, what a sweepstakes!! Just look at where you could go—

GRAND PRIZE LIVE LIKE ROYALTY AT A CARIBBEAN VILLA
8 days and 7 nights for four people at a Caribbean island villa, including round trip air fare. (See 4-color cover of ad for details.)

But that's not all —

FIRST PRIZE (3 winners) choose any one of three (3) vacation packages for two including airfare A) One week Caribbean cruise departing from San Juan; B) One week in Honolulu; C) One week in Acapulco.

But we said everybody's a winner!!

EVERYBODY WINS a $100 TravelDollars certificate*, redeemable on any vacation package, including air and ground accommodations, from a printed brochure. Just go to any travel agent and find a vacation package that most appeals to you, and bring the printed brochure home with you. Then call the telephone number on the back of your TravelDollars certificate, explain what you wish to do, and the reservations will be made. It's that simple!!

Oh!! One more thing —

EVERYBODY WINS a $10 Logicsoft discount coupon, good towards your next Logicsoft purchase. So now not only have you entered this stupendous sweepstakes, but you're getting an additional $10 off Logicsoft's already low prices on their entire inventory; and you still get their 30 day money-back guarantee!! Whatta deal!!

You receive both the TravelDollars certificate and the Logicsoft coupon when you receive your order; the same order that entered you in the sweepstakes.

SO, C'MON, CALL LOGICSOFT NOW, AND LIVE LIKE ROYALTY!!

*TravelDollars certificates can be used with any vacation package of $500 or more per person including air and ground accommodations from a printed brochure. Certificates cannot be combined for use on a single trip

OFFICIAL SWEEPSTAKES RULES

1 No purchase necessary For every product ordered by phone or mail during the period September 1 through December 31, 1987, you will automatically be entered in the sweepstakes (i.e., 3 products = 3 entries) Phone and mail orders must be received by December 31, 1987 You also may enter by hand printing your name, address, telephone number, and "Logicsoft Live Like Royalty Sweepstakes" on a 3"x 5" card and mailing it in an envelope to: LOGICSOFT SWEEPSTAKES, P O BOX 19-1764, MIAMI BEACH, FLA 33119, to be received by 12/31/87 Only one entry per envelope Mechanical reproductions are not acceptable. Logicsoft is not responsible for late, lost, or misdirected entries

2 Winners will be selected in a random drawing by an independent judging organization about January 15, 1988 Winners will be notified by mail and may be required to sign an affidavit of eligibility and liability publicity release within 21 days of notification. Travel companions of winners will be required to sign releases. All taxes are the sole responsibility of winners. Odds of winning depend on number of entries. All prizes will be awarded. No transfers of prizes and no substitutions except by Logicsoft due to prize unavailability

3 PRIZES. One (1) Grand Prize of a one week (8 days, 7 nights) vacation for four people at a Caribbean island villa consisting of round trip air travel from any international airport in the continental United States. $1,260 cash allowance for meals and beverages, the services of a cook, maid, and gardener at the villa, use of a jeep and a cash allowance for fuel, and $1,000 cash (approximate retail value $15,000) Three (3) first Prizes: Choose from any of these vacation packages: a) One week Caribbean cruise departing from San Juan, b) one week in Honolulu, c) one week in Acapulco; all packages are for two persons and include round trip air from major gateways, 7 night accommodations, taxes, tips, and other extras as described in the tour operator's brochures. Cruise also includes food. (Approximate retail value of the first prizes are $4,700.00) ONLY ONE PRIZE PER PERSON

4 Sweepstakes open to legal residents of the U.S., age 21 or over, except employees and their families of Logicsoft, Inc., its affiliates, subsidiaries, and advertising agency, and Lexington Promotions, Inc Void in NY, FL and where prohibited or restricted by law By participating you agree to these rules and the decisions of the judges.

5 For a list of major prize winners, send a self-addressed, stamped envelope to: LOGICSOFT SWEEPSTAKES, P.O. BOX 19-1764, MIAMI BEACH, FLA. 33119 (by 2/15/88).

LOGICSOFT®
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YOU ARE ENTERED AUTOMATICALLY every time you place any order (i.e., 3 products=3 entries!) — each product ordered enters your name for all drawings. So, every product you purchase will increase your chances of winning!!

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Summary of Features: Graphics-Only Scanners

(Products listed in ascending price order)

	HP ScanJet Hewlett-Packard Co.	**AT&T Overview Scanner** AT&T	**AST TurboScan*** AST Research Inc.	**IBM 3118 Scanner Model 20** IBM Corp.	**Scan-CAD Accessory** Houston Instrument	**SpectraFAX 200** SpectraFAX Corp.	**Howtek Scanmaster** Howtek Inc.
List price	$1,495.00	$2,000.00	$2,395.00	$2,750.00	$2,995.00	$3,995.00	$6,649.00
HARDWARE							
Overall dimensions, incl. paper feed (H×W×D in inches)	4×14.5×21	15.5×14.5×14	4.5×14.5×16	13.5×15.5×25	.75×2×2.75	10×25×15.25	7×20×19
Footprint (W×D in inches)	14.5×21	14.5×14	14.5×16	15.5×16.5	Fits on plotter head	25×15.25	20×19
Panel controls	None	None	None	None	None	None	None
Scan area	Flatbed	Projector	Platen feed	Platen feed	Flatbed (provided by plotter)	Flatbed	Flatbed
Paper handling							
Paper path	Flatbed	Flatbed	Semicircular roller	Curved roller	Flatbed (provided by plotter)	Flatbed	Flatbed
Paper feed (max. no. of pages)	Single sheet	Single sheet	Single sheet	Sheet feeder (30)	Single sheet	Single sheet	Single sheet
Page size (inches)							
Min. length	.85	No minimum	5	3.9	No minimum	No minimum	No minimum
Min. width	.55	No minimum	3	2.8	No minimum	No minimum	No minimum
Max. length	1.3	10	14	14	48	14	17
Max. width	.87	8	8	8.5	36	8.5	11
Paper thickness (inches)							
Min. thickness of original	No minimum	No minimum	No minimum	.013	No minimum	No minimum	No minimum
Max. thickness of original	No maximum	1	No maximum	.035	Depends on plotter	No maximum	No maximum
Max. skew	N/A	N/A	N/A	N/A	Depends on plotter	N/A	N/A
Interface							
Slot size	Full	Half	Half	Half	Full	Half	Half
Type of interface	Proprietary	Proprietary	Parallel	Serial, high-speed serial	Proprietary	Proprietary	GPIB
Interrupts	N/A	N/A	Parallel	Fixed	Switched	Fixed	Switched
DMA channel	N/A	N/A	Parallel	Serial	Switched	Fixed	Switched
Input/output hex address	Switched	Switched	Switched	Serial	Fixed	Switched	Switched
SOFTWARE							
Calls other software from within package	○	○	●	○	○	○	○
Documentation							
No. of pages	179	112	100	380	80	200	108
Quick-start chapter	●	●	●	○	○	○	●
Paper tutorial	●	○	●	● (for *ImagEdit* only)	○	●	○
On-line tutorial	○	○	○	○	○	○	○

●—Yes ○—No

N/A—Not applicable: does not have this feature.

*OCR Software not available at press time

	HP ScanJet Hewlett-Packard Co.	**AT&T Overview Scanner** AT&T	**AST TurboScan*** AST Research Inc.	**IBM 3118 Scanner Model 20** IBM Corp.	**Scan-CAD Accessory** Houston Instrument	**SpectraFAX 200** SpectraFAX Corp.	**Howtek Scanmaster** Howtek Inc.
SCANNER FEATURES							
Settings	Brightness	Contrast, brightness	Density, contrast, brightness	Contrast, brightness	Contrast	Density, contrast, brightness	Contrast
Graphics type	Line art (B&W), continuous tone	Line art (B&W), continuous tone	Line art, continuous tone	Line art (B&W)	Line art (B&W)	Line art (B&W), color	Line art (B&W), continuous tone, color
Modes	Line art (B&W), dither, gray scaling	Line art (B&W), dither, gray scaling	Line art (B&W), gray scaling	Line art (B&W), dither	Line art (B&W)	Line art (B&W), dither	Line art (B&W), gray scaling
Resolution (dots per inch)	75, 150, 300, and customized for any number between 75 and 300	80	300	120×120, 240×120, 240×240	200	200	75, 100, 150, 200, 300, and variable in 1-dpi increments
Scan area							
Fixed	○	○	○	● (under IDU)	○	○	○
Adjustable	●	●	●	● (under *ImagEdit*)	●	●	●
Max. no. of windows	1	1	4	1	1	1	1
Scan interface							
Proprietary software	●	●	●	●	●	○	●
Works with paint program	○	●	○	○	○	●	○
Paint program included	○	●	○	○	○	●	○
Editing mode							
Writes to disk before editing	●	○	●	○	○	●	○
Preview mode (edit, then save)	●	●	●	○	○	●	○
Editing features in scanner menu							
Crop—scales from (percent)	N/A	N/A	25	N/A	N/A	0	0
Crop—scales to (percent)	N/A	N/A	100	N/A	N/A	100	100
Scale *x*-axis from (percent)	50	N/A	100	33	N/A	0	N/A
Scale *x*-axis to (percent)	200	N/A	900	300	N/A	100	N/A
Scale *y*-axis from (percent)	50	N/A	100	33	N/A	0	N/A
Scale *y*-axis to (percent)	200	N/A	900	300	N/A	100	N/A
Rotates from (degrees)	N/A	0	0	0	N/A	0	N/A
Rotates to (degrees)	N/A	360	360	360	N/A	360	N/A
Increments of rotation (degrees)	N/A	90	90	90	N/A	45	N/A
Inverts image (top to bottom)	○	●	○	●	○	●	○
Flops image (left to right)	○	●	○	●	○	●	○
Mark	○	●	●	●	○	●	○
Copy	○	●	●	●	○	●	○
Cut	○	●	●	●	○	●	○
Paste	○	●	●	●	○	●	○
Move	○	●	●	●	○	●	○
Paint	○	●	●	●	○	●	○
Lines	●	●	●	●	○	●	○
Palette	○	●	●	○	○	●	○
Print window	○	●	●	○	○	●	○
Print file	●	●	●	●	○	●	●
Other	○	○	○	●	○	●	○
Filing							
Compression available	○	●	●	○	○	●	○
Format	TIFF, .PCX, .MSP, *GEM Paint*	.PCX	TIFF, .PCX, .PIC	TIFF, .IDF, Scanmaster 8815, DCA/RFT document format, document data stream, BASIC image format	.IMG, Datacopy, *AutoCAD*	.PCX	Targa, .PCL, .SIM

Summary of Features: OCR-Only Scanners

(Products listed in ascending price order)

	Saba Handscan Saba Technologies Inc.	**TransImage 1000 System** TransImage Corp.	**Abaton Scan 300*** Abaton Technology Corp.	**I-SYS 102** I-SYS Technology Inc.	**I-SYS 101** I-SYS Technology Inc.	**Pro-Scan Model 5050** Totec Co. Ltd.
List price	$649.95	$2,595.00	$3,195.00	$5,995.00	$6,995.00	$8,990.00
HARDWARE						
Overall dimensions, incl. paper feed (H × W × D in inches)	2.5 × 3 × 5	2.85 × 1.75 × 6.28	11.5 × 14.5 × 17	8 × 14 × 12	18 × 24 × 24	12 × 21 × 29
Footprint (W × D in inches)	3 × 5	1.75 × 6.28	14.5 × 17	14 × 12	24 × 24	20 × 17
Panel controls	4 programmable buttons	8 programmable buttons	None	Brightness	Scan/read, format	Margin, font, run, stop
Scan area	Hand-held	Hand-held	Platen feed	Platen feed	Platen feed	Platen feed
Paper handling						
Paper path	Hand-held	Hand-held	S-curve roller	Curved roller	Semicircular roller	Straight roller
Paper feed (max. no. of pages)	Single sheet	Single sheet	Single sheet	Bin feed (50)	Bin feed (50)	Bin feed (50)
Page size (inches)						
Min. length	No minimum	No minimum	3	3	4	5
Min. width	No minimum	.1	.5	3	4	8
Max. length	No maximum	No maximum	14	14	14	14
Max. width	No maximum	14	8.5	8	8	8.6
Paper thickness (inches)						
Min. thickness of original	No minimum	No minimum	.011	.018	.018	.018
Max. thickness of original	No maximum	No maximum	.06	.035	.026	.026
Max. skew	N/A	N/A	N/A	.25	.5	.33
Interface						
Slot size	Full	Full	Full	Full	N/A	N/A
Type of interface	Proprietary	Proprietary	Proprietary	Proprietary	Serial	Serial
Interrupts	Switched	Switched	N/A	Fixed	Serial	Serial
DMA channel	N/A	Switched	Switched	N/A	Serial	Serial
Input/output hex address	Switched	Switched	Switched	N/A	Serial	Serial
SOFTWARE						
Calls other software from within package	○	○	○	○	○	○
Documentation						
No. of pages	180	300	21	30	30	115
Quick-start chapter	●	○	○	○	○	○
Paper tutorial	●	●	○	○	○	○
On-line tutorial	○	○	○	○	○	○
OCR FEATURES						
Settings	Brightness	Brightness	Density, contrast, brightness	Brightness	N/A	Brightness
OCR scan areas	Partial page	Partial page	Partial page	Partial page	Full page only	Partial page
Programmable margins from (in inches)	N/A	N/A	N/A	.5	N/A	0 vertical; 0.2 horizontal
Programmable margins to (in inches)	N/A	N/A	11	8	N/A	13.5 vertical; 8.3 horizontal
Max. no. of windows	N/A	N/A	1	1	1	1
OCR interface						
Proprietary software	○	○	●	●	○	○
WP/editor program	●	○	○	○	○	○
Other	Keyboard emulator	Keyboard interrupt	None	None	Communications software	Communications software

●—Yes
○—No
*Graphics software not available at time of review.
N/A—Not applicable: does not have this feature.

	Saba Handscan Saba Technologies Inc.	**Transimage 1000 System** TransImage Corp.	**Abaton Scan 300*** Abaton Technology Corp.	**I-SYS 102** I-SYS Technology Inc.	**I-SYS 101** I-SYS Technology Inc.	**Pro-Scan Model 5050** Totec Co. Ltd.
RECOGNITION						
Fonts						
ANSI OCR-B	○	●	●	○	○	○
ANSI OCR-C	○	●	○	○	○	○
Courier 10	●	●	●	●	●	●
Courier 12	●	●	●	●	●	●
Courier 15	○	●	●	○	○	●
Courier 72	○	●	●	○	○	○
Elite 12	●	●	●	●	●	●
Gothic 15	○	●	○	○	○	●
Letter Gothic	●	●	●	○	○	●
OCR-A	○	●	○	●	●	●
OCR-B	○	●	○	●	●	●
OCR-C	○	●	○	○	○	○
Prestige Pica 10	●	●	●	●	●	●
Prestige Elite 12	●	●	●	●	●	●
Titan 10	○	●	○	○	○	○
Titan 12	○	●	○	○	○	○
Near-letter-quality dot matrix	●	●	○	○	○	○
Dot matrix	○	○	○	○	○	○
Font size (points)	10, 12	6, 12, condensed	6, 8, 10, 12	10, 12	10, 12	10, 12, 15
Highlights						
Regular	●	●	●	●	●	●
Boldface	○	○	●	●	●	●
Underline	○	○	●	○	○	●
Italic	○	○	○	○	○	○
Double strike	○	○	●	●	●	●
Double density (shadow print)	○	○	○	●	●	○
Other	None	None	None	None	None	None
Page formatting						
Blank lines	○	○	●	●	●	●
Paragraphs	○	○	●	●	●	●
Indents	○	○	●	●	●	●
Tabs	○	○	●	●	●	●
Page breaks	○	○	○	●	●	●
Programmable page formatting						
Carriage return	●	●	○	○	●	●
Carriage return/line feed	●	●	○	○	●	●
Hard returns	○	●	○	●	●	●
Soft returns	●	○	○	○	●	●
Spaces to tabs	●	○	○	●	●	●
Spaces to programmable	●	●	○	○	●	○
Paragraph markers	○	○	○	○	●	●
Page breaks	○	○	○	●	●	○
Other	None	Vertical lines	None	None	None	None
Window(s)	○	○	○	○	○	○
Features						
Loads fonts automatically	●	●	○	●	●	●
Ignores lines or rules on the page	●	○	●	○	○	●
Ignores graphics on the page	○	●	○	○	○	●
Flags unread characters	●	●	○	●	●	●
Has user-definable flag	●	●	○	○	○	○
Lets user intervene with unread characters	○	○	○	○	○	○
Scans multiple documents into one file	●	●	●	●	●	●
Uses a spelling checker during recognition	○	○	○	○	○	○
Has user-definable dictionary or lexicon	○	○	○	○	○	○
Allows automatic text formatting	○	○	●	○	●	●
Formats before saving file	●	●	○	○	○	○
Offers 7- and/or 8-bit recognition	○	○	○	○	○	●
OCR file formats						
ASCII text file	●	●	●	●	●	●
DCA (Document Content Architecture)	●	●	○	○	○	○
Other	Programmable	Programmable	None	None	None	Buyer specified

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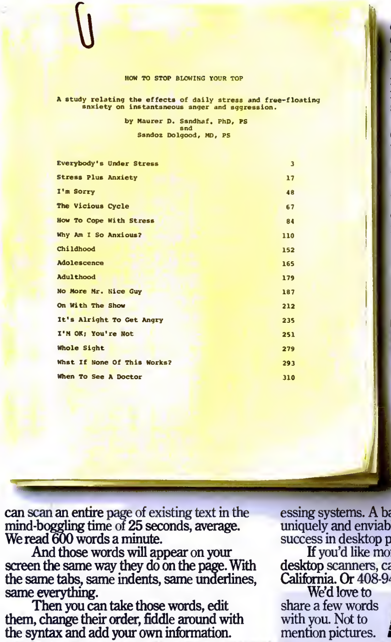

HOW TO STOP BLOWING YOUR TOP

A study relating the effects of daily stress and free-floating snxiety on instantsneous snger and sggression.

by Maurer D. Ssndhaf, PhD, PS
and
Ssndoz Dolgood, MD, PS

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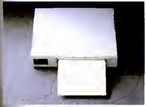

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DEST

CIRCLE 281 ON READER SERVICE CARD

lease software will dither the 80-dpi image and generate a 300-dpi image to represent the 16 shades of gray the Overview can create. That should result in printed output of much higher quality.

Despite our somewhat mixed results, we were impressed with AT&T's package. Obviously a special-purpose device, the Overview meets its design targets quite nicely. For many businesses that use multiple-location conferences, it could be just what the doctor ordered, and the finished product should smooth out some of the rough spots we found. The scanner will sell for $2,000, the interface board for $300, and the software, including *Scanware* and *PC Paintbrush Plus,* for $750. That's big bucks for you and me, but not for large firms running presentations in 50 locations. **—Glenn A. Hart**

CANON USA INC.

Canon IX-12 Image Scanner

With dimensions of 3½ by 13⅜ by 11½ inches (HWD), the Canon IX-12 Image Scanner can fit neatly on your desktop. Paper trovels through the front of the machine ond over o straight bed of rollers before it ejects onto o plastic troy in the rear.

The Canon IX-12 Image Scanner, which sells for $945, is a simple machine with a low desktop profile. Its size and price speak well for it, but Canon's scanning sight is far from 20/20, even with type fonts it is supposed to be able to read well. And when it comes to reading type not in its repertoire, the Canon does very badly, in some cases turning a document into an unreadable jumble of symbols.

Installing the full-length board in the computer is really a snap. Generally you won't have to touch the jumper switches; the default settings work just fine. If you have an EGA monitor or you're on a local area network, it's another story. Both the scanner and EGA card attempt to use the same memory address; so if you don't change the default jumper settings on the board, your monitor will appear dead when you boot up your computer.

Fixing this problem is just a matter of switching the JP4 jumper to the first and second prongs rather than to the second and third, and adding a "/01" to the end of the handler's filename. You have to run the handler at the DOS prompt before you start the OCR program. Unfortunately the slim manual that comes with the hardware, and even Canon's optional OCR software manual, fail to explain this jumper switching maneuver. But Canon was responsive to the problem and knew what was wrong immediately; I was clearly not the first user beset by this problem.

SITS NICELY The IX-12 sits very nicely on a normal desktop. It measures 13⅜ inches wide by 11¼ inches deep by 3½ inches high. It doesn't have any panel controls, only a small green power light to let you know it's on. The paper feeds through the front, travels over a straight bed of rollers, and ejects out back, resting at an upright angle on a plastic tray. The machine can accept at least five pages at a time, depending on the thickness. If you're lucky you might even get up to a dozen sheets through before the machine balks.

The Canon machine had a fair amount of difficulty accurately recording the text documents it scanned. Not one page was fully accurate, and some were totally scrambled into random symbols, as if the text was encrypted rather than copied. It had the most trouble with text produced on a 9-pin dot matrix printer in draft mode. Perhaps the next worst, although a great deal better, was text from a 24-pin dot-matrix printer in draft mode.

Difficulties mounted when text had underlining, with lined borders on the pages, and contained type fonts the system does not support. *ReadRight,* the OCR software that Canon offers as an option, is supposed to support nine fonts. But when the system scanned a page of 275 characters in Prestige Elite text—one of the supported fonts—there were at least 18 errors, depending on how you count them. The ma-

PC FACT FILE

Canon IX-12 Image Scanner
Canon USA Inc.
One Canon Plaza
Lake Success, NY 11042
(516) 488-6700

List Price: $945; A200-IX21F controller board, $245; *ReadRight*, $595.

Requires: 384K RAM (640K RAM recommended), two disk drives.

Supports: IBM CGA, IBM EGA, Hercules monochrome graphics adapter.

In Short: The Canon IX-12 is a small, simple machine with no hardware frills. It does a decent job if the original documents are very clear, but it can have difficulty even if the text it is supposed to read is almost without error. The price may be its most attractive feature.

CIRCLE **639** ON READER SERVICE CARD

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Q. What does Peachtree Complete include?
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- Accounts Payable
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- Fixed Assets
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- Payroll

2. An Installation Guide to lead you step by step through our simple installation procedure.
3. An Accounting Primer, written for Peachtree users by an industry expert, to explain accounting concepts.
4. Tutorials on each module with sample data to make learning easier.
5. A complete Reference Library with detailed instructions in plain English on all software functions.

Q. is Peachtree Complete really the same product that used to sell for $600 per module?
A. Peachtree Complete is basically the same accounting system that both Peachtree and IBM sold for about $5,000 but with substantial improvements in function and presentation.

With more than 150,000 users to its credit, Peachtree Complete has been the PC World Class Winner in its category for two of the last three years.

Q. What's the difference between Peachtree Complete and the $69.95 systems?
A. Peachtree's system is called Complete because it contains the eight most needed accounting packages (including payroll) and all reference materials for one price. Remember, it was designed as a $4,800 accounting software system.

The $69.95 systems, on the other hand, are incomplete. They were designed to sell for $69.95 and require the purchase of additional modules to be comparable—payroll, $49.95 more; tutorials, $19.95 each; etc. Everything is a la carte.

Q. How soon will I outgrow the system?
A. Peachtree Complete handles revenues up to $21,000,000, so only the largest companies will outgrow the system. The ability to process data for an unlimited number of companies is one of the system's biggest selling points.

An optional multi-user module soon to be available allows Peachtree Complete to be installed in a Local Area Network. And Peachtree Data Query, for just $199, lets you quickly transfer your accounting data to many popular spreadsheets and databases, as well as produce custom reports.

Q. What if I'm not satisfied with Peachtree Complete?
A. When you purchase Peachtree Complete directly from Peachtree Software, you're protected with a 30-Day Money Back Guarantee (an option even the most expensive accounting products don't offer).

If you're not satisfied, simply return the complete product in saleable condition within 30 days and your purchase price will be promptly refunded.*

InfoWorld Report Card

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CIRCLE 358 ON READER SERVICE CARD

chine and its software can't handle proportional spacing.

Many of the scanning errors seem to involve difficulty in distinguishing between similar letters. For example, lowercase *j*'s frequently became lowercase *i*'s. The problems seemed to occur more at the edges of pages rather than at the centers. Another common error was reversing uppercase and lowercase letters. But it did read numbers very well.

The $595 *ReadRight* software, written for Canon by OCR Systems, proved simple to use. The main menu gives you the opportunity to change the settings for paper length, darkness, the text format in which data is saved, and three other settings. Scanning is initiated by simply pressing the Enter key once the original has been fed into the IX-12. The machine pulls the paper to the ready position as soon as it senses you are feeding it in. The function keys are used to issue commands.

MENU CHOICES There are two other menus in the system, a Frame menu and a Utilities menu. Through the Frame options you can frame a section of text in a document that includes graphics so that the machine scans only the text and speeds the scanning process. The Utilities menu lets you manipulate documents after they've been scanned. Here again, the software is simple, almost self-explanatory. The manual serves as a good backup with clear writing about the software features and a section on troubleshooting and tips.

The Canon scanner is supported by a number of paint programs, such as *PC Paintbrush* and *Halo DPE*, but it doesn't handle graphics very well. If the text you have to scan is crisp and clear, then the Canon IX-12 Image Scanner might be a good machine to consider. It's certainly in the right price range.

—Henry Fersko-Weiss

COMPUSCAN INC.

CompuScan PCS PageReader

The $3,495 CompuScan PCS PageReader is a bin-feed scanner made by a pioneer in the OCR market. CompuScan introduced its first reader in 1974, and its products have come a long way from the refrigerator-size scanners that read only special OCR typefaces.

The CompuScan PCS PageReader comes configured with its own 68000 microprocessor for character recognition calculations. The processing capabilities greatly increase the scan speed of the PCS PageReader, allowing it to scan an average page in 30 seconds.

As expected, the CompuScan PCS is a top-quality OCR reader, scanning the average page in just 30 seconds. Unfortunately, though, CompuScan's OCR background is also evident when using the scanner in graphics mode.

The CompuScan PCS is a full-featured OCR scanner that will work with PCs, dedicated word processors, and other types of computers. Unlike some lower-cost scanners that use your PC's processor, it performs all the calculations involved in character recognition in the scanner with a 68000 microprocessor. The scanner's use of its own microprocessor improves its scan speed, especially on 8088-based PCs.

The CompuScan PCS recognizes and maintains an impressive range of document-formatting features. Where most scanners will just insert spaces into the document when they scan a centered line, the CompuScan PCS actually uses the center code; this makes the document easier to edit. You can also set up the CompuScan PCS to ignore the speckles on Xerox copies, to flag scanned characters it isn't sure of, and to recognize superscripts, subscripts, and underlined text.

TWO MODES The user's manual includes special installation instructions for popular word processors, including *Microsoft Word*, *WordStar*, *WordPerfect*, and *MultiMate*. The software has two basic operating modes: if your word processor supports IBM's DCA/RFT format or includes a conversion utility for DCA/RFT, the scanner will save scanned documents in that format. If your word processor doesn't support DCA/RFT, the scanner will run your word processor and force the scanned data into the keyboard type-ahead buffer. If you use an obscure word processing program that isn't supported by CompuScan and doesn't support DCA/RFT, the scanner will save the text in ASCII document format.

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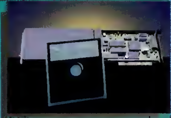

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Listing See Page 220

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CIRCLE 217 ON READER SERVICE CARD

column sample in just one pass.

But the *CompuScan Image Editing Software* (*CIES*), licensed from Media Cybernetics, isn't as impressive.

CIES is a powerful paint program that includes all the features the average person could want, along with support for a wide range of printers, graphics boards, and pointing devices. It has the usual paintbrush, airbrush, pencil, and eraser icons, along with icons for drawing circles, ellipses, boxes, and so forth.

ICON DRIVEN The scanner interface is also icon driven, and it allows you to set the scan area and contrast. Unfortunately, even if you choose to scan a small image, the system still uses an 8½ by 11-inch virtual page.

CIES saves images in a native .PIC format, or you can use the scissor icon to save part of the page in *Microsoft Windows* .CUT format. CompuScan also supplies utility programs to convert .CUT files to *Pagemaker* TIFF and *Ventura Publisher* .IMG file formats.

FACT FILE

CompuScan PCS PageReader
CompuScan Inc
81 Two Bridges Rd , Bldg. 2
Fairfield, NJ 07006
(201) 575-0500

List Price: $3,495; PCS graphics option, including *Image Editing CIES* software and cables, $500

Requires: 640K RAM (640K RAM and 1-Mbyte expanded memory for 200 to 300 dpi); hard disk drive.

Supports: Amdek MAI, AT&T Indigenous, Conographics 40, Genius VHR, Hercules monochrome adapter, IBM CGA, IBM EGA, all Number Nine graphics boards, Quadram Quadscreen and Quadcolor II, Scion PC 640, Sigma Color 400, STB Systems Graphix Plus II, Tecmar Color Master, Tecmar Monochrome, Wyse WY-700; dot matrix, ink jet, and laser printers; Microsoft-compatible mice; GTCO Large Pad, Houston Instrument HiPad Digitizer, Hitachi Tiger Pad, Pencept Penpad, Summagraphics Bitpad 1 Tablet and MM Series Tablet; Honeywell microLYNX trackball, FTG FT-156 Light Pen

In Short: This good hin-fed scanner, made by a pioneer in the scanner market, is fine at OCR; it would be a winner in graphics scanning, too, if the *CIES* software let you specify the resolution in dots per inch and set the page size.

CIRCLE **638** ON READER SERVICE CARD

Installing *CIES* is a tricky process, made worse by the fact that .PIC files saved with one configuration will be unreadable if you change any of the system parameters. Especially annoying is the interrelationship between your printer selection and the resolution. You can't install *CIES* for a resolution higher than your selected printer can print. Resolution must be specified in dots per page for the *x* and *y* dimensions as opposed to the more common dots per inch.

CIES is also a memory hog. A full-page scan at maximum resolution (300 dots per inch) requires 640K bytes of normal memory plus a full megabyte of EMS memory. Since the page size is fixed, you can't scan a small graph or photo at high resolution if you can't hold a full page at that resolution in memory.

The CompuScan would have a real winner if it could just get Media Cybernetics to allow you to specify the resolution in dots per inch and to set the page size when using *CIES*. Then people with normal amounts of memory could scan small images at full resolution.

Consider the CompuScan PCS PageReader if you need a fine piece of hardware with commendable OCR capabilities and only occasionally need to scan graphic images.—**Howard Marks**

DATACOPY CORP.

Datacopy JetReader
Datacopy 730

Datacopy Corp. gives you a choice of two scanners: the Datacopy JetReader, a roller-feed model aimed principally at OCR users, and the Datacopy 730, a flatbed scanner designed with the publishing industry in mind. Which you use depends on your needs; both offer solid OCR and graphics scanning at a reasonable price.

DATACOPY JETREADER The $1,300 JetReader is a scanner/OCR system that includes multiple software components and an elegantly simple piece of hardware. The hardware component, the Datacopier 220, has a footprint of approximately 10 by 15 inches, roughly the size of a small dot matrix printer. This unit holds up to ten sheets of paper that feed automatically during a scan. You can also insert single sheets manually without restarting the process; the unit waits 20 seconds after the last sheet is finished before shutting down. The feed mechanism, which includes paper-edge guides to keep everything lined up, works smoothly. Sheets travel straight through the unit, so there is no curling or possible damage to photographs or to other stiff material. The largest possible paper the feeder takes is 10 by 14¼ inches, with weights from 16 to 45 pounds.

The only controls on the Datacopier 220's front panel are three pressure-sensitive settings to change the dark-to-light contrast threshold. LEDs indicate whether the scanner is ready, busy, or in an error condition. Installing the hardware is very simple: you insert the interface board into your PC, connect the supplied cable from the board port to the scanner, and you're ready to go. The board has two jumpers, but the default factory settings worked on my heavily occupied AT.

FACT FILE

Datacopy JetReader
Datacopy Corp.
1215 Terra Bella Ave.
Mountain View, CA 94043
(800) 821-2898
(415) 965-7900

List Price: $1,300; PCImage Kit, including interface card and cable, *PCImage* scanning software with run-time version of *Microsoft Windows*, *PC Paintbrush Plus*, $695; OCR Plus Kit, including *OCR Plus* software, interface card and cable, $895; *OCR Plus* software, $695; *PC Image*, $495; *PC Paintbrush Plus*, $149.

Requires: 512K RAM, two disk drives (hard disk drive recommended).

Supports: All graphics adapters, printers, mice, and pointing devices supported by *Microsoft Windows*.

In Short: The JetReader is a complete system, including a sheet-feeding scanner and several complementary, but independent, software packages. While the multiple software environments confuse the issue somewhat, the system is quite effective as a whole.

CIRCLE **637** ON READER SERVICE CARD

The Datacopy JetReader is a roller-fed scanner that is roughly the same size as a small dot matrix printer. Three pressure-sensitive settings arrayed across the front panel control the dark-to-light contrast threshold. The scanner connects to the PC via an interface board.

SOFTWARE PACKAGE After the hardware is set up, the installation fun really begins. The system I tested came with the *PCImage* software kit, which includes *PCImage* for scanning, *PC Paintbrush Plus* for editing scanned images, and two packages for OCR, including a learning mode. To use all of this software, you'll need plenty of room on the required minimum 20-megabyte hard disk drive; each program eats up a lot of disk space. Since they can be installed separately, you might consider using only the software you definitely need, particularly if you'll be doing mainly image scanning. A full page scanned at 300 dots per inch, for example, consumes just over a megabyte.

Quite apart from storage requirements, the three software components work differently. *PCImage* operates within *Microsoft Windows* using a mouse (it comes with a run-time version of *Windows*, but the retail version is recommended for full capabilities). *PC Paintbrush Plus* sets up its own environment and also uses a mouse. The OCR software doesn't share the colorful graphics interfaces of the other programs it uses pull-down menus instead. If your only application is converting paper text documents to disk format, there's really no reason to install *PCImage* and *PC Paintbrush Plus*.

Even if you will be scanning images, you need not install *PC Paintbrush Plus* unless you intend to use that product to run the scanner or to edit stored images saved in one of the compatible image-file formats. Datacopy says that many people take JetReader-stored images directly into desktop publishing programs such as Aldus Corp.'s *PageMaker* or Xerox's *Ventura Publisher*. *PC Paintbrush Plus* is included for those who don't have other software to change or manipulate images further.

Whatever software you install, the process is simple: you merely follow prompts on the screen. It's worth noting that the software supports all screens, printers, and mice that work with *Microsoft Windows*—a fairly inclusive list.

MEMORY NEEDS Forget about using RAM-resident software with these programs; you'll want all the memory possible for the scanning process. The JetReader uses all available RAM first and then uses disk space as virtual memory, but in an often time-consuming process like scanning, the priority is on the faster RAM. *PCImage* and the *OCR* software both warn you if AUTOEXEC.BAT will be changed; if you're running the scanner with *PC Paintbrush Plus*, you'll need to change your CONFIG.SYS file.

The ease of learning the JetReader depends on the software. With some practice, *PCImage* is easy to use, though it helps if you already know *Windows*. The trickiest part is working with graphics windows of scanned images and keeping track of the parts of the environment. *PC Paintbrush Plus* includes a tutorial that demonstrates many of the software's features. The OCR software, which uses clear pull-down menus, is the simplest and most straightforward of the lot.

All scanning is software controlled. To pick up images, you simply choose one of three items on the Scanner Set menu: Line Art, Picture A, and Picture B (the latter two are for continuous-tone or halftone emulation). When an image is scanned, it is first brought into a temporary file, typically more than a megabyte in size if you are scanning in full 300-dpi resolution. Once an image is scanned, you can select Window from the Display menu to frame whatever portion of the full page you want to work with. Then you can save or print just that portion of the original image to conserve disk space. You can also rescan the original hard copy with the window in effect. This double scanning may give you a better copy than on the first shot.

■ Many people take JetReader-stored images directly into desktop publishing programs such as Aldus's *PageMaker*.

Though *PCImage* gives you some editing capabilities, you'll need the full power of *PC Paintbrush Plus* if you really want to get fancy. You can either read a file saved by *PCImage* with *PC Paintbrush Plus* or

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CIRCLE 333 ON READER SERVICE CARD

can use the paint program to scan directly. When you reduce or enlarge an image onscreen the resolution will change and may appear fairly blotchy, depending on your monitor. The image itself is still stored in full resolution.

The JetReader did a fine job on all of our samples, including our color wheel, which it read in shades of gray. The greatest weakness was in its relations with our laser printer. I couldn't get the Laserjet Plus to print anything other than black and white. Datacopy says that a new release of the printer drivers will address this issue.

OCR CAPABILITY Optical character reading is accomplished with two software packages: *OCR*, which provides the basic capabilities, and *OCR Plus*, which offers a learning mode. To scan a page, you first select one or more type styles from pull-down menus. The basic package reads standard type styles, including several varieties of Courier, Pica, and Prestige Elite. When you load a type style, the patterns for its characters go into memory; I could load no more than six at once on a 640K-byte AT running DOS 3.2. Although I reasoned that loading as many type styles as possible would maximize character-recognition accuracy, that isn't the case: usually one or two type styles suffice and give the best accuracy. During a scan, a small indicator in the screen's upper-right-hand corner shows the type style being recognized, which helps in selecting the best style for future runs of material from the same source. You can't change fonts during a scan, so you should test one page before starting a long run.

There are two ways of handling unrecognized characters: you can make the program flag each unmatched character, or you can have it stop and ask you to define a character during a run. The latter is probably quickest for short documents; if you choose the former, you'll have to run a search or a spelling check in your word processor to ferret out the unmatched-character flags. No OCR package is perfect; for 100 percent accuracy, someone should proofread the material while the original is still around.

The software did a good job of reading standard Pica and Elite text, performed adequately with dot matrix print, handled boldface type fine, and did reasonably well with underscored characters. Also, since you can put ten sheets of paper in the JetReader bin at one time, the operation can proceed unattended once you're satisfied that the type style is being recognized adequately. At the beginning of each run, the system asks for a filename. Although OCR files are saved in ASCII, the system includes a utility to convert them into any of ten word processing formats: *DisplayWrite, MultiMate, WordStar, WordStar 2000, IBM Personal Editor, WordPerfect, Volkswriter, Microsoft Word*, and two generic formats called LineFeed and Paragraph Feed.

The documentation for the system is spotty. For *PCImage* and the OCR programs, it's only marginally acceptable; plan on making several conceptual leaps all by yourself. The documentation for *Windows* and *PC Paintbrush Plus* is much better. One obvious omission is a separate book that describes the software and hardware elements and helps the user decide which to use and how to set up.

DATACOPY 730 The $1,800 Datacopy 730 differs from the JetReader system only in its hardware component. Unlike the JetReader's Datacopier 220, which can scan up to ten automatically fed pages, the 730 system's Datacopier 230 is a flatbed scanner that reads one sheet at a time. The flatbed lets you scan documents regardless of size: pages of magazines or books; large-format artwork; very thick stock; even three-dimensional originals and objects, as long as they fit under the scanner's flexible top cover. Because you don't have to feed the original through a set of rollers, you can also scan very small originals without having to mount them on a larger paper carrier, as I had to do in feeding a circular color wheel through the JetReader.

■ The 730 system's Datacopier 230 flatbed lets you scan documents regardless of size, as long as they fit under the scanner's top cover.

Besides allowing flexibility in the size

The Datacopy 730 is a flatbed scanner, but in most other respects, the 730 bears a close resemblance to the Datacopy JetReader. The two scanners share the same panel controls, LED indicators, interface board, and software.

FACT FILE

Datacopy 730
Datacopy Corp.
1215 Terra Bella Ave.
Mountain View, CA 94043
(800) 821-2898
(415) 965-7900

List Price: $1,800; PCImage Kit, including interface card and cable, *PCImage* scanning software with run-time version of *Microsoft Windows*, *PC Paintbrush Plus*, $695; OCR Plus Kit, including *OCR Plus* software, interface card and cable, $895; *OCR Plus*, $695; *PCImage*, $495; *PC Paintbrush Plus*, $149

Requires: 512K RAM, two disk drives (hard disk recommended).

Supports: All graphics adapters, printers, mice, and pointing devices supported by *Microsoft Windows*.

In Short: The Datacopy 730 system includes a flatbed scanner and several complementary, but independent, software packages. This unit is primarily intended for the publishing industry but can be used for OCR, though its flatbed single-sheet scheme could slow things down a bit.

CIRCLE **636** ON READER SERVICE CARD

of your original document or image, the flatbed 730 system gives you better control over second-level scans than does the JetReader. You can scan once to find the exact position of the part of a sheet you want to use, then set the software to rescan the exact portion or window on the original. Since you don't have to move the original, you can get more accurate second scans of images with this model than with the JetReader. If you work with sheets that contain mixed text and graphics or several different images but only want to focus on one part, the increase in control that the 730 provides makes this unit attractive.

Aside from the scan unit, the 730 and the JetReader are identical: same interface board, same software—and same results. In my testing, the Datacopy 730 performed exactly like the JetReader in both graphics scanning and OCR. The only difference was in document feeding, which is more convenient for graphics scanning on the 730 and better for OCR with the JetReader's ability to handle multiple pages without user intervention. The 730 scanned halftone, continuous-tone, and line art beautifully; it also did a fine job reading characters if told the proper type styles to use.

SOLID SYSTEMS On the whole, both the Datacopy JetReader and the 730 work very well and reflect advances in software and hardware technology, as well as continual price decreases. The one drawback is a confusing array of software environments, but that's a problem only while you're getting used to the system. For just under $2,000, the Datacopy JetReader gives you everything you need for single- or multiple-sheet scanning of images and text. And although the Datacopy 730 costs a bit more, you'll want to give it a close look if your primary application is graphics scanning.—**Bruce Brown**

DEST CORP.

Dest PC Scan Plus

Dest Corp., always a major contender in the OCR market, last year introduced the PC Scan, an OCR system that combined compact hardware with a memory-resident interface that could place scanned text directly in a document. The Dest PC Scan Plus is essentially the same hardware, but Dest has added graphics scanning and a *Microsoft Windows* environment to its base unit, which sells for $2,495. (If you don't have *Windows*, don't worry; Dest provides a run-time copy.) Dest still includes a memory-resident OCR interface for use outside *Windows* and throws in *PC Paintbrush Plus* for graphics editing.

About a third smaller than an XT, the PC Scan Plus unit fits almost anywhere, with everything you need right on the face of the machine. Pages are fed into an upper bin, passed through a semicircular paper path, and deposited below it. That may be a little tortuous for thick originals or for images pasted onto a page, but I could get our pasted-up sample through after trimming the edges.

INSTALLATION Hardware installation is straightforward, though I hit a few snags—mostly my own doing. Dest's phone support was excellent, however, and after a few false starts I had the system running. Software installation varies in complexity. *Text Pac*, the optional OCR software, is loaded first, followed by *Publish Pac* for graphics scanning and then by *PC Paintbrush Plus*. Commands are added at the beginning of both CONFIG.SYS and AUTOEXEC.BAT, so you may want to check for conflicts with other software. *Windows* is a bit slow on my 8088 machine, but I found the Dest interface very easy to use and preferred it to scanning from within a paint program.

Graphics can be scanned in line or photograph (halftone) mode at 200, 240, or 300 dots per inch. Line art is scanned at a default contrast, but you can adjust contrast for photographs. The system lets you scan a full page up to 14 inches long or define a scanning window to scan smaller pages or to isolate an image on a page. Images are scanned into a temporary file and displayed on screen to size. The PC Scan Plus offers limited image editing before saving: you can zoom out to full size or zoom in, and you can isolate, cut, paste, or copy images. Beyond that, however, you must save the image and use *PC Paintbrush Plus* to edit it, or store it in TIFF format for editing in a publishing program. Photograph mode saves a halftone image at the scanned resolution using 16 gray-scale approximations.

Our test samples scanned quite well on the Dest system. The reduced-mode display gives you an idea of the total area

EDITOR'S
CHOICE

FACT FILE

Dest PC Scan Plus
Dest Corp.
1201 Cadillac Ct.
Milpitas, CA 95035
(408) 946-7100

List Price: $2,495; IBM SCSI interface card and cabling, $295; *Text Pac*, $595; *Publish Pac*, $595.

Requires: 256K RAM, two disk drives; graphics scanning with *Publish Pac* requires 362K RAM (640K RAM recommended), hard disk drive.

Supports: All graphics cards, printers, mice, and pointing devices supported by *Microsoft Windows*.

In Short: An excellent OCR/graphics scanner combination that's easy to use and versatile.

CIRCLE **635** ON READER SERVICE CARD

The Dest PC Scan Plus is about two-thirds the size of an IBM PC-XT chassis. Pages are fed through a bin located on the upper face of the machine. They are passed through a semicircular paper path, and then exit from a slot below the bin.

scanned, and zoom mode lets you examine the images at increased screen resolutions in 25 percent increments. Scanned photographs showed increased orders of halftoning as I zoomed in, which made it easy to identify specific tones in areas I might want to edit later.

SOLID OCR Text scanning is easy with Dest's *Text Pac*. The program uses omnifont OCR, so you don't have to specify the type style, pitch, or line spacing: you just feed pages. *Text Pac* read our badly copied samples with only a 15 percent error rate, which is impressive, and read the better-quality originals with little trouble. Like most OCR software, this program reads only monospaced or limited proportional-spaced characters, but the range of fonts is extensive and up to date, from 9-pin dot matrix through 24-pin near letter quality and including proportional typewriter characters. *Text Pac's* only obvious limitation is its lack of control over page size; also it won't let you select a portion from a page and has no landscape mode.

Text formatting under *Windows* is automatic and elementary. *Text Pac* converts tabs, centering, and paragraph indents into spaces, and eliminates hyphens, justification spaces, extra line spacing, and page breaks. The program does convert columnar text by adding line endings, but you have to move the columns into place later if you want to convert the text. Unfortunately, these settings can't be altered.

You can, however, select format options using *Text Pac*'s memory-resident interface. The software lets you convert tabs, centering, underlines, hyphens, page breaks, and columns into formatting codes for *DisplayWrite 3*, *MultiMate*, *Microsoft Word*, *PFS:Write*, *WordPerfect*, and *WordStar;* you can define formatting features for other word processors as well. You can use this memory-resident interface and still use *Windows*: though few word processors can run in the *Windows* environment, most can be called up by it.

Having different text-formatting schemes for *Windows* and the memory-resident mode is puzzling. If Dest is indeed committed to the *Windows* interface, why can't you have the same OCR features? Or, from another angle, why offer *Windows* at all when you can scan within *PC Paintbrush Plus?* Still, though the integration isn't seamless, it's far better than in most systems that sell the pieces of the puzzle but never tie it together.

The Dest PC Scan Plus is one of the best all-around OCR/scanner systems on the market. It's heavily weighted in favor of OCR options, but graphics scanning certainly isn't overlooked, and Dest gives you more editing features than do most manufacturers. These features, good support, and a reputable track record make Dest an excellent choice if you are seeking a multipurpose machine.—**Tom Stanton**

EIT INC.

EIT Personal Scanner 2000

The $2,495 EIT Personal Scanner 2000 is a curved platen scanner that looks like a small safe. It comes with its own proprietary software that does an excellent job of OCR with fonts it recognizes and has an auto-learn mode that can pick up new fonts. But like learning a new language, the auto-learn routine takes time and can be frustrating. The software also does a good job scanning graphics images and lets you merge images and text on a page with its "compose" feature.

The scanner measures 13 inches wide by 13 inches deep by 10.6 inches high. The sides are indented at the top to make carrying handles. And the machine is quite

PC MAGAZINE FACT FILE

EIT Personal Scanner 2000
EIT Inc.
25 Just Rd.
Fairfield, NJ 07006
(201) 227-1447

List Price: $2,495

Requires: 512K RAM, hard disk drive.

Supports: Hercules monochrome graphics adapter, IBM CGA, IBM EGA, Micro Display Systems Genius VHR, Tecmar Graphics Master; dot matrix, laser printers; all mice.

In Short: The EIT Personal Scanner 2000 is a boxy, lightweight machine. It does an excellent job at OCR when it is one of seven recognized fonts. If the font isn't recognized, there is an auto-learn option. The graphic-scanning capabilities are also quite good and allow you to merge scanned images on one page with a compose option.

CIRCLE **634** ON READER SERVICE CARD

portable because its outer shell is lightweight plastic. But because of the plastic and the fold-up platen cover, the durability of the machine is an open question.

The on/off switch is conveniently placed on the top of the machine, so it's easy to operate if it sits on the floor or on the edge of your desk. The contrast switch is also on the top. There is no power indicator, so when you first turn the machine on there's no way to tell if it's actually working. There are no telltale engine noises unless you press your ear against its side—and then it's hard to hear.

SIMPLE INSTALLATION The installation of both the hardware and software is very simple. The scanner board is a half card with a set of DIP switches that don't seem to need resetting. The software comes on four disks. An installation routine loads the software on your hard disk and takes you through a configuration utility. There is one minor annoyance with the software. Every time you reboot your system and start the software program, you have to go through a program loading routine. While it takes only about 15 seconds, it's an unnecessary extra step.

The software functions are accessed off a menu screen with pull-down menus. You can use a mouse to unroll these window menus and to initiate all of the graphics functions, but when it comes to using the OCR portion of the system you are thrust back onto the keyboard—you have to type menu number selections and use the function keys. The screen design also changes radically in the OCR portion. In the graphics mode or at the main menu, the screen is gray, the menu bar is white and the characters are black. In the OCR mode, when you first enter it, the background is red and the characters are white. But as soon as you have done the first scan, the screen background becomes black and the characters stay white.

■ The EIT Personal Scanner's software lets you merge images and text on a page with its "compose" feature.

The EIT Personal Scanner 2000's lightweight plastic shell and indented sides that farm two handles make this scanner completely portable—though its durability is questionable. The scanner feeds and discharges paper using a curved platen mechanism.

In OCR mode, the system will recognize seven fonts: six IBM Selectric fonts and one Epson font. For the system to be totally accurate, the document you scan must be in one of these fonts and have the right pitch. If the document is light or dark you can compensate with the contrast switch. But if the density of the characters varies considerably because of boldface type or poor photocopy quality, you can have a lot of trouble. The system is very sensitive to the contrast settings. A change of only one gradation can result in a 50 percent loss or gain in recognition.

Scanning an 8½-inch by 11-inch document takes about 35 seconds. When the scan is finished, there is a snapping sound, like the sound of an ignitor on a gas grill. After the scan, you have to process the image, which is another menu selection. The processing time varies tremendously, depending on how much trouble the system is having in recognizing characters. If the recognition is perfect it can take about a minute. If there is very little recognition, the processing time will be even shorter—perhaps 20 seconds. But if the system is struggling valiantly to decipher a document, then just one page can take more than 5 minutes. While the processing is going on, the document will appear line by line on the screen. When it is over, however, you can't display the page. To see it you have to transfer the file, which is in ASCII, to your word processor.

AUTO-LEARN MODE The EIT software has an auto-learn mode in OCR so that it can work with fonts other than those in its library. However, this is a very time-consuming activity. When you scan a document for learning and then process it, you will be presented with blowups of the unrecognized characters depicted in Xs. At that point you have to align the letter within two vertical bars and a horizontal baseline bar and then type it. This goes on letter after letter. Depending on the size of the document, this can take an hour or more.

IMS-286

10 MEGAHERTZ

$999

Base System

- Intel 80286 processor running at 10MHz, switch selectable to 6MHz
- Phoenix BIOS
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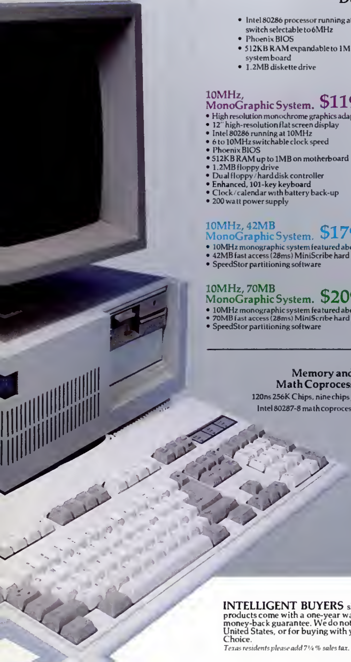
- 1.2MB diskette drive
- Dual diskette drive/fixed disk controller
- **Enhanced, 101-key keyboard**
- Clock-calendar with battery backup
- 200-watt power supply
- Illustrated installation and operations manual



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- Phoenix BIOS
- 512KB RAM up to 1MB on motherboard
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- Clock/calendar with battery back-up
- 200 watt power supply

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IMS-88

10 MEGAHERTZ

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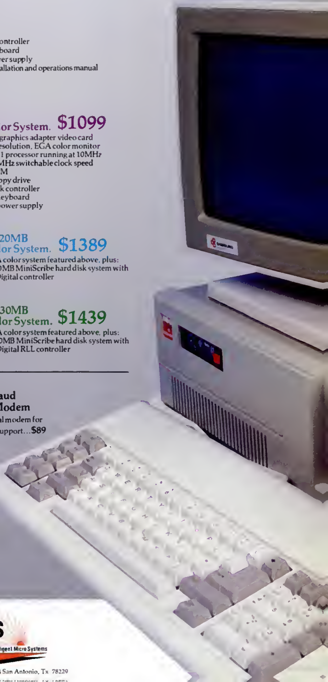

10MHz, MonoGraphic System. $699

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- 4.77 to 10MHz switchable clock speed
- 640KB RAM
- 360KB floppy drive
- Floppy disk controller
- AT-style keyboard
- 150-watt power supply

10MHz, EGA Color System. $1099

- Enhanced graphics adapter video card
- 14" high-resolution, EGA color monitor
- Intel 8088-1 processor running at 10MHz
- 4.77 to 10MHz switchable clock speed
- 640KB RAM
- 360KB floppy drive
- Floppy disk controller
- AT-style keyboard
- 150-watt power supply

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IMS
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1633 Babcock, Suite 424 San Antonio, Tx 78229

■ EIT's OCR software has an auto-learn mode that allows it to work with fonts not in its library.

And then the system may still need further learning.

Obviously this isn't a practical approach for the casual use of a new font. But if you're going to use the same font continually, then it's worth the effort to have the system learn. The best approach is to produce an uppercase and lowercase character set for the font and learn from that, rather than from an actual document—it will take less time and ensure that all the characters are learned up front.

When scanning graphics images, you can adjust the paper size specification of the original, but only with four settings: the normal letter and legal sizes, a European letter size (8½ by 10 inches), or auto size, which means the system finds the bottom of the page if it's not one of the other lengths. The scan resolution can vary from 200 dots per inch to 300 dpi.

Again the scan takes about 35 seconds, but there is no processing time afterward: the image just appears on the screen. The quality of the screen image depends on your monitor and is generally smaller, but the image will print out in its original size and will have a much better quality than what you see on the screen.

Once you've scanned an image, you can mix it on a page with other graphics image files or OCR files to add text. You indicate where things should be placed by dragging the mouse pointer across the screen to open boxes. These composed pages can be saved as independent files. You can also extract portions of an image by opening a box around the part you want and then saving it as a separate file.

Not only is the EIT Personal Scanner 2000 a good scanning system for both OCR and graphic images, but you can use it in conjunction with EIT's fax board to make a very complete alternate input system.—**Henry Fersko-Weiss**

PC MAGAZINE Performance Tests: Graphics and Text Scanning

Optical character reading is the hot technology in scanners, but high-resolution graphics image scanning and its application in desktop publishing is where the money is for most scanner manufacturers. Our quick-comparison sample output table shows how the scanners reviewed measured up against our choice for top graphics-scanning capabilities: the Microtek MSF-300C. All sample outputs were printed on an HP Laserjet with the exception of the output from the IBM scanners, which was printed on the IBM Page Printer.

PC Labs selected and tested a gallery of graphics and text samples to assess the ability of the scanners to recognize and convert gray scales, line art, logos, and photographs to graphic bit images as well as their ability to recognize and convert monospaced and proportionally spaced text to OCR frame character ASCII code. Additionally, we scanned a color wheel to investigate the conversion of color values to gray scale. This test revealed that the original color values varied so widely that an accurate statement about color-to-gray-scale conversion could not be made. However, color originals can indeed yield acceptable black-and-white digitized images.

Since our last study of scanners, optical character reader technology has improved significantly, and the list of products with OCR capabilities has grown. The results of our OCR tests are discussed in the product reviews; however, a full test description appears here. The Abaton Scan 300, the I-SYS 101 and 102, the Saba Handscan, Totec's Pro-Scan Model 5050, and the TransImage 1000 System offer optical character recognition only and are not represented in the graphics comparison.

Gray scale Not all graphics scanners are designed to read gray scales, halftones, and photographs, but we tried them anyway because you might, too. The scanners that have no gray-scale scanning capabilities are the ShapeScan SS-300, the Houston Instrument Scan-CAD Accessory, the EIT Personal Scanner 2000, and the CompuScan PCS PageReader. You can find a gray-scale strip in most photographic studios for establishing consistent gray tones. Our test shows how well each scanner reads shades of gray. Pay attention to the boundaries between gray values.

Halftone We used a picture of a young boy to see how the scanner handles a typical photograph. The results are a function of the halftoning and editing of the image.

Line art The sample contains a white box and concentric circles on a black-and-white background grid. Poor alignment causes stair-stepping (or jaggies) on long lines. The circles and the tiny background grid is a severe test of the scanner's resolution powers.

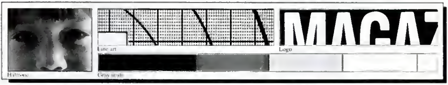
Logo We used a sheet with three logos as another test of the scanner's ability to scan one of the most common forms of line art used in business. To test the scanner's zoom capability, we scanned three logos, then zoomed in on a single logo.

OCR The OCR samples were designed to test font recognition and formatting capabilities. All of the test pages were originals except for two very bad photocopies, which were intended to test worse-case possibilities.

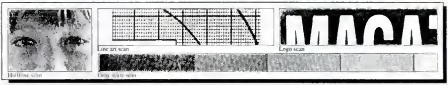
The type samples included dot matrix specimens of draft and near-letter-quality fonts made with 9-pin and 24-pin printers, as well as laser printer samples of Courier Pica, Prestige Elite, and Times Roman. Most OCRs have a hard time recognizing underlined characters because the line touches the descenders. Along with three lines of regular text, we included one line of underlined characters and one boldface line.

The other OCR samples included a letter printed on letterhead, an outline, a simple table, a boxed table, several paragraphs with various indentations, and a *1-2-3* spreadsheet. These samples were designed to test the scanner's ability to process word processing formats. Within these samples, we included several combinations of similarly shaped characters to test each OCR's character-recognition ability. The spreadsheet in particular contains several nasty examples, including strings of 1s and ls, 0s and Os, and so on. In most cases we didn't expect the OCRs to successfully recognize all the characters, but several systems did better with the spreadsheet than they did with the cover letter.

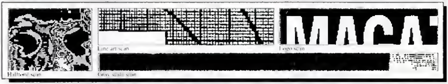
Original Art



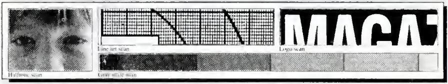
AST TurboScan



AT&T Overview Scanner

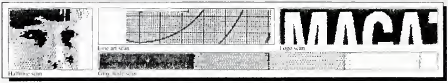


Canon IX-12 Image Scanner



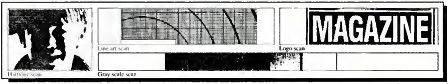
CAT Image Scanner

No sizing option. Printed at default settings.

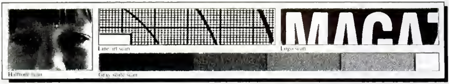


CompuScan PCS PageReader

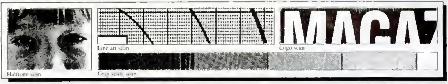
Scans at 200 dpi. Printing at 300 dpi compresses the original scanned image.



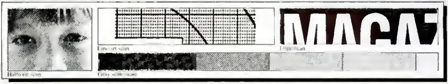
Datacopy JetReader



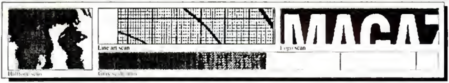
Datacopy 730



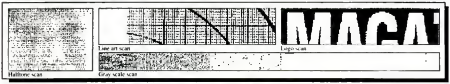
Dest PC Scan Plus



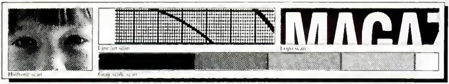
EIT Personal Scanner 2000



Epson Image Scanner Option Kit

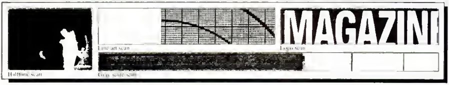


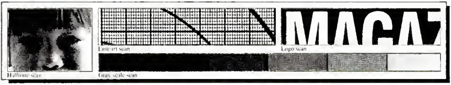
HP ScanJet



Scan-CAD Accessory

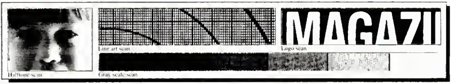
Scans at 200 dpi. Printing at 300 dpi compresses the original scanned image.





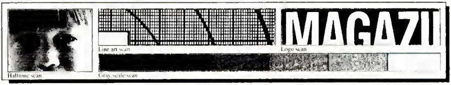
Howtek Scanmaster

Scans continuous and halftone art at 240 dpi. Printing at 300 dpi compresses the original scanned image.



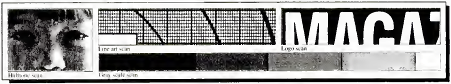
IBM 3117 Scanner

Scans continuous and halftone art at 240 dpi. Printing at 300 dpi compresses the original scanned image.

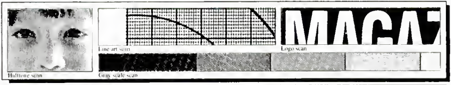


IBM 3118 Scanner Model 20

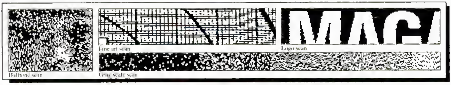
Scans continuous and halftone art at 240 dpi. Printing at 300 dpi compresses the original scanned image.



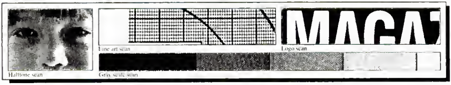
IOC Reader Model 400



Kurzweil Discover 7320



PixiScanner



Microtek MS-300A

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"King Kong" Bundy
Heavyweight Wrestler

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CIRCLE 537 ON READER SERVICE CARD

VENDEX
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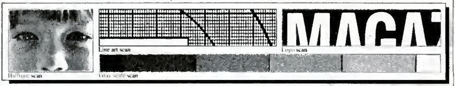
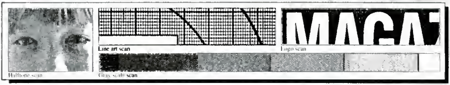
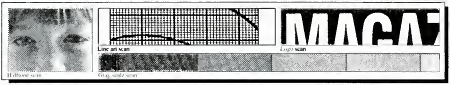
Microtek MS-300C



Microtek MSF-300C

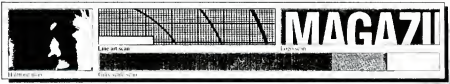


The Laser Scanner Model LS-300



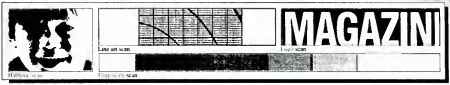
ShapeScan SS-300

Scans at 240 dpi. Printing at 300 dpi compresses the original scanned image.

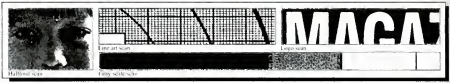


SpectraFAX 200

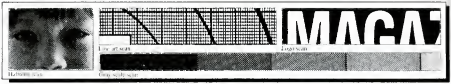
Scans at 200 dpi. Printing at 300 dpi compresses the original scanned image.



Crystal Scan Image Scanner Model 300I



TLC IS-300



HEWLETT-PACKARD CO.

HP ScanJet

When scanning with the HP ScanJet, you place originals atop an 8½- by 13-inch sheet of glass, then close the cushioned lid. The design of the ScanJet allows users to scan images from a variety of sources, including books, magazines, and posters.

The HP ScanJet from Hewlett-Packard Co. is an attractive scanner with a low profile and an even lower price tag ($1,495). Over the years, HP has been associated with high-quality products with high prices. The ScanJet follows in the HP tradition, the only exception being its reasonable price.

Although it's short in stature, the ScanJet has a fairly large footprint, about 14 inches wide by 21 inches long. A cushioned lid rises from the top of the unit to uncover an 8½- by 13-inch sheet of glass, on which you place the original image. The ScanJet can scan images from almost any source—books, posters, and so forth—as long as the section to be scanned is roughly smaller than a legal-size sheet of paper. An optional sheet feeder is available to add multipage capability.

Software controls the scanner's operations. The only direct interface you have with the scanner is by using the power-on indicator on the side and by viewing the tiny power-on indicator on the front of the unit.

In addition to the ScanJet, you'll need the $495 PC Interface Kit, which includes the interface card and cable and the PC-compatible scanning software, the *Scanning Gallery*. The scanner connects to the plug-in card through the cable, using a 25-pin connector. The card comes strapped to memory location C4000, but you can change the location by using DIP switches if it conflicts with other cards already present in the host. HP supplies a diagnostic program to put both the scanner and the interface through their paces before you attempt to perform a complicated software installation.

PC MAGAZINE FACT FILE

HP ScanJet
Hewlett-Packard Co.
Greeley Division
700 71st Ave.
Greeley, CO 80634
(800) 752-0900

List Price: $1,495; PC Interface Kit, including interface card and cable, *Scanning Gallery* software, $495.

Requires: 384K RAM (640K RAM recommended), hard disk drive.

Supports: All graphics adapters, printers, mice, and pointing devices supported by *Microsoft Windows*.

In Short: This scanner-only package (third-party vendors provide OCR for this system) offers good speed and quality images.

CIRCLE **633** ON READER SERVICE CARD

The *Scanning Gallery* software package is a *Windows*-based image editor that mates seamlessly with the ScanJet. (Apparently, HP also plans to create interface cards and software for use on other, non-PC computers to enable you to use the ScanJet with a variety of hosts.)

INAUSPICIOUS BEGINNINGS The *Scanning Gallery* starts inauspiciously. Before it can start scanning, you must add a device driver to the CONFIG.SYS file. The installation program for the *Scanning Gallery*, like so many others of its ilk, attempts to make this addition for you, modifying the existing CONFIG.SYS file to add the device driver and buffer commands without regard to what might be in the file already. In its defense, the installation program does not destroy the existing CONFIG.SYS file, and the manual does tell you how to make the necessary changes manually if you prefer.

Fortunately, the *Scanning Gallery* allows you to install it in the directory of your choice. Since the *Scanning Gallery* is a *Windows* application, you may install it under *Windows*, if that program is already present. If you do not already have *Windows* installed in your system, you can use the "run-time version" of *Windows* that HP supplies with the scanner; it is set up to execute this single application.

Once installed, the *Scanning Gallery* works beautifully. If you select Preview, the ScanJet performs a quick scan of the image. From this preview image you can then mark out the exact area on which to perform a detailed scan. You can also use the preliminary scan to determine the image darkness, contrast, and so forth. This method works well with the ScanJet's single-sheet operation: the original sits in one place while the scanner performs multiple scans until you find the right combination of settings.

When the slower, detailed scan is complete, you use the *Scanning Gallery* editor, which is designed to work much like any other paint program. It includes all the common edit functions such as cut, paste, flip, and invert.

As of this writing, though, the *Scan-*

ning Gallery is not complete, and most of the edit functions do not work yet. Registered owners of the current version will receive the completed *Scanning Gallery* without charge as soon as it is available, which HP anticipates will be in late 1987 or early 1988.

HIGH-COST SUPPORT Unfortunately, the documentation failed to make it clear that all the edit functions do not currently operate. To find out what the problem was, we called the vendor. That was when we discovered that technical support from HP costs $45 per hour. The low cost of the ScanJet itself, however, calmed our indignation over these charges.

No OCR capability is available from HP for the ScanJet. Third-party vendors, most notably Flagstaff Engineering, are adapting or have adapted their OCR software packages to the scanner, but HP does not currently bundle an OCR package with the unit.

The ScanJet's scanning speed is good, and the quality of the images it produces is comparable to that of the better scanners on the market. If you can manage without character recognition, the HP ScanJet is a fine solution to your scanning needs.
—Stephen Randy Davis

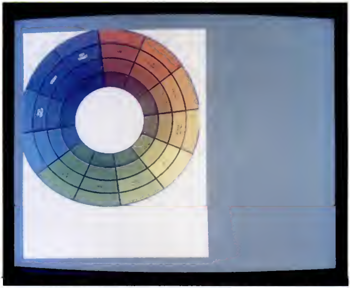
HOWTEK INC.

Howtek Scanmaster

Though black-and-white images can be useful, color images unquestionably communicate with more impact, convey more information, and evoke more emotion. Most optical scanners see things only in shades of gray, but with the Howtek Scanmaster you can scan full-color images. And although the current software has some shortcomings, this $6,649 system can produce superb results.

The Scanmaster is a large, handsome tabletop flatbed scanner with an 11- by 17-inch bed. As on many other desktop copy machines, the entire top portion of the Scanmaster moves laterally, taking the source past a stationary scanning head buried in the mechanism—and requiring some clearance on both sides. The system produces full-color images using a single CCD (charged coupled device) sensor and an electronic red-blue-green color separa-

The Howtek Scanmaster, a large tabletop flatbed model, scans detailed, full-color images beautifully. The color images are produced using a CCD (charged coupled device) sensor and a sophisticated electronic red-green-blue color separation system.



Howtek's Scanmaster uses the AT&T Targa board to produce color images on analog RGB monitors. Our scan of the color wheel above shows the variety of colors used by the Targa series for capturing detailed eye-catching images.

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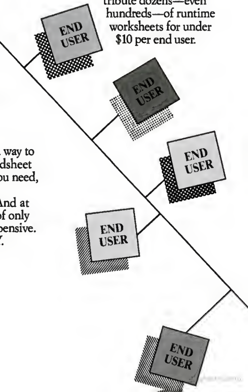

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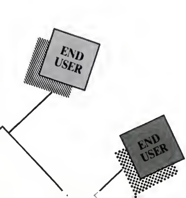
#6



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CIRCLE 288 ON READER SERVICE CARD

1-2-3 is a registered trademark of Lotus Corporation.

FACT FILE

Howtek Scanmaster
Howtek Inc.
21 Park Ave.
Hudson, NH 03051
(603) 882-5200
List Price: $6,649
Requires: 640K RAM, hard disk drive; high-resolution monitor recommended.
Supports: AT&T Targa 16, 24, or 32 graphics adapter; laser printers.
In Short: A graphics-only scanner that can produce beautiful full-color images using a Targa video board and an analog RGB monitor. The system is expensive, however, and the software couldn't cope with some of our tests.

CIRCLE **632** ON READER SERVICE CARD

tion system. It does not, however, handle OCR work.

TARGA CONNECTION Under the software currently provided by Howtek, the Scanmaster mates only with AT&T's costly Targa line of display boards, which can produce stunning color images on analog RGB monitors and which offer many advanced video functions. (Since the Targa system doesn't provide the functions of a standard DOS board, you'll need another video adapter and display monitor as well.) Though Targa boards don't produce particularly high resolution, the large number of colors used results in detailed, highly attractive images. The various Targa models differ, however, in how many colors they can display at once. For our tests, we used a Targa 24 and a Sony analog RGB monitor.

The Scanmaster employs the General Purpose Interface Bus, or GPIB, which is a high-speed interface also called the IEEE bus or the HPIB bus, depending on whom you talk to. The half-length GPIB interface card provided by Howtek came preconfigured, requiring no installation effort on our part. A batch file automatically adds the necessary device driver to your existing CONFIG.SYS file or creates a new file if necessary.

All functions are software controlled. Howtek's *Scanit* package is designed to display scanned images on the Targa-driven screen, to generate Targa-compatible files on disk, and to send scans directly to Howtek's Pixelmaster color printer. The user interface is quite intuitive; you select commands and parameters with function keys, choosing from continuous-tone, halftone, line art, and text modes and selecting either black-and-white or color scanning. The Scanmaster lets you specify the size of the area to scan, along with the image contrast. Resolution of up to 300 dots per inch is possible, several fixed lower-resolution settings are available, and you can vary resolution in 1-dpi increments. Another interesting option controls scanner sharpness.

Our tests of the Scanmaster were a mixture of high highs and low lows. We first scanned some color images onto the Targa-Sony video display. The results were absolutely fantastic, with stunning clarity and color reproduction from photographs, magazine covers, and our test color wheel. PC Labs staffers gathered around to marvel at the Howtek's speed and fidelity, and small moans of craving emerged from the art department.

BUGGY When the group dispersed, some of the bloom came off the rose. Our attempts to execute the tests common to all the scanner evaluations in this project ran into some serious problems. Simply put, the *Scanit* software is buggy. When we tried to scan our test materials and print them on our Laserjet Plus, as we had done for many other scanners, we had little luck: the line art and text modes didn't work, producing featureless gray output; the continuous-tone and halftone modes worked but coughed up unattractive, grayish results. The program's parameters interacted in an unpredictable and confusing manner. For instance, a positioning command recognized our *y*-axis specification but not our *x*-axis input.

While not in the bug category, *Scanit's* relations with our printer weren't always friendly. The program simply dumps the scanner's output to the Laserjet or saves it to a file for subsequent printing; a printer with 512K RAM couldn't output more than half a page of graphics. Most other scanner software works around this problem. In addition, full-resolution, 300-dpi scanning to printer or disk was painfully slow. And *Scanit* lacks editing facilities, painting capabilities, and other standard features of scanner-support software.

■ Most optical scanners see things only in shades of gray, but with Howtek's Scanmaster you can scan full-color images.

To be fair, *Scanit* wasn't expressly designed for any of these applications. Its obvious goal is to create beautiful screen images and to generate files for processing with other Targa-compatible graphics-editing software. On these tasks, it does an excellent job. What's more, Howtek plans to introduce new software for the Scanmaster soon. It will be welcome.

DEEP POCKETS Assembling a complete system around the Scanmaster requires deep pockets. The system, including interface card and *Scanit*, costs $6,649. As mentioned, you'll also need a Targa board and high-quality monitor; a first-rate color printer seems appropriate, too. And you'll want and need other Targa software.

But what a system you'll get! We know of nothing quite like it in the microcomputer environment. The quality is superb; the uses limited only by your imagination. The software isn't yet in the same class as the hardware, but even as it stands now, the Howtek is Wow Tech!—**Glenn A. Hart**

IBM CORP.

IBM 3117 Scanner
IBM 3118 Scanner Model 20

IBM Corp. markets two different scanners, the IBM 3117 Scanner, a single-sheet flatbed design sold for $1,095, and the IBM 3118 Scanner Model 20, a multi-sheet platen-feed unit sold for $2,750. By introducing two different scanners, IBM is

ULTRA-HIGH-END SCANNERS

The capabilities of desktop scanners and OCRs are dwarfed when you compare them with those of high-end systems.

Impressive as they are, desktop scanners and OCRs offer a fairly limited range of features when compared with high-end systems. For example, most graphics scanners are limited to 300 dots per inch and usually store files as bit maps. Most OCRs read only monospace characters, some with a narrow range of known fonts, and cannot process forms and other complex documents.

Big performance requires big machines that cost from $20,000 to $200,000. These systems are usually sold by VARs and systems integrators rather than over the counter, and in many cases a PC would be the peripheral rather than the other way around. Among the Olympians in the OCR/scanner market:

Although **Datacopy Corp.**, of Mountain View, California, has two PC-based scanners, it also offers a flatbed scanner, the 920 system, which has adjustable optics for scanning images and some 3-D objects at various resolutions. The Datacopy 920 system, which retails for $18,950, can scan a 2-square-inch area at 2,000 dpi or a standard page at 400 dpi in a single pass. You can use the 920 on a PC or with a minicomputer host.

Eikonix Corp., a Kodak subsidiary based in Bedford, Massachusetts, makes two scanners for the high-end graphics scanning market. The Eikonix 4434, which costs $49,500, digitizes E-size (engineering-size) drawings in a single pass at up to 230 dpi and is designed for CAD/CAM applications. The Eikonix Designmaster 8000 is a digital color separation system with 420, 660, and 1,333 line-per-inch resolution that can be used in most facets of publishing. Prices are available upon request.

ImagiTex, of Nashua, New Hampshire, produces a wide range of products designed for the professional imaging market, including prepress imaging, document archiving, and computer-aided publishing (CAP), particularly for technical publishing. The Image Station offers up to 1,132-dpi resolution for an image, but its strength is its ability to output to any device at the required resolution on typesetters, plotters, or laser printers. The Image Station offers full gray-scale preprocessing and can produce magazine-quality halftones (120 lpi). Prices start at $90,000.

■ The $19,950 Kurzweil 4000 remains one of the premier OCR systems. It can be taught to recognize almost any typeface.

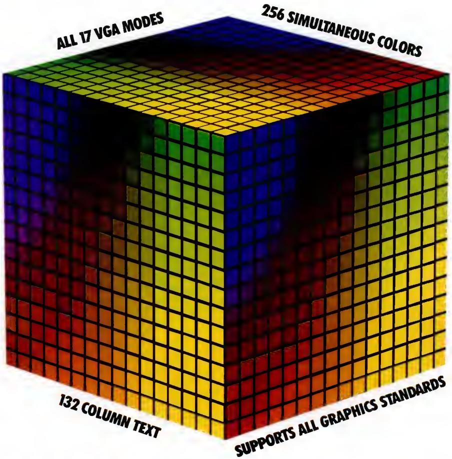
Intergraph Corp., of Huntsville, Alabama, has over 12 years' experience with CAD/CAM systems and imaging. The Intergraph system scans 40-square-inch drawings with resolutions from 12 to 200 microns and is designed primarily for CAD and cartography. Prices start at $220,000. The E/Scan 200 scans large-format drawings in a single pass at 200 dpi, vectorizes bit maps, and categorizes elements in overlays for editing and processing. E/Scan prices start at $50,000. Intergraph also sells ImagiTex scanners for publishing.

The $19,950 Kurzweil 4000 remains one of the premier OCR systems. An operator can teach the 4000 to recognize almost any typeface. **Kurzweil Computer Products,** of Cambridge, Massachusetts, now offers ArtScan, a $4,000 option that scans both text and line art (no halftones) in a single pass. With ArtScan you mark text and graphics regions before scanning. The 4000 pulls the page apart during processing and sends text for recognition and line art for storage and processing. The graphics resolution ranges from 100 to 364 dpi and can be stored as TIFF bit maps, in Xerox's .RES format, or in the Group 3 CCITT format for fax.

Last year **Palantir Software**, of Santa Clara, California, debuted the CDP (Compound Document Processor), OCR/scanner that reads whole pages of typeset text in a matter of minutes and scans images at 300 dpi, all in a single pass. The CDP also offers impressive forms-processing software. When we reviewed the CDP last year, it required a minicomputer host and could be connected to ATs via a local area network. This year Palantir has introduced the Recognition Server, a processor that allows PCs to act as the scanner host, so you no longer need a minicomputer. With the Recognition Server software, you can use all of Palantir's document recognition, formatting, and forms-processing capability and convert scanned graphics to TIFF. One important feature is the Recognition Server's ability to process text or graphics from any scanner that can create TIFF. The Recognition Server is available from OEMs, VARs, or systems integrators, so call Palantir for the name of a local contact.

The 4991S1 Graphics Input Station is a CAD/CAM system that costs $150,000. It automatically scans and converts the image into vector format in real time and transmits data to a drawing database for retrieval and post-processing. **Tektronix's** Information Display Group, which is responsible for this product, is based in Wilsonville, Oregon.
—Tom Stanton

ANNOUNCING VGA EXTRA



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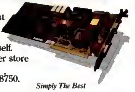
320 x 200	**640 x 480**	**720 x 400**
256 colors from 262,144 or 64 shades of gray	high resolution 16 colors from 262,144 or 16 shades of gray	high quality (9 x 16) text



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CIRCLE 517 ON READER SERVICE CARD

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CIRCLE 493 ON READER SERVICE CARD

Midwest Headquarters 428 S Adams, Hinsdale, IL 60521 Unitek and UniCard are trademarks of Unitek Systems Corp IBM is a registered trademark of International Business Machines Corp apparently trying to solve a problem every manufacturer has encountered: the difficulty of satisfying all users with one design. Yet despite their outward differences, the 3117 and the 3118 appear to be remarkably similar in practice.

Besides the two scanners, IBM offers a bewildering combination of interface cards to which they will connect. You can connect both scanners to a serial COM port or through a special serial interface, which IBM calls the High Speed Adapter. In addition, the 3117 can interface with a plug-in short card designed especially for it. In our tests, we used the 3117 connected to its native adapter and the 3118 joined with the High Speed Adapter. No real difference in scanning speed was noted.

The 3117 is a flatbed scanner. To begin using it, you use the expected method of lifting the padded lid and placing the original on the glass. Start the scan and you are in for a surprise, though. The upper section of the 3117, containing the original, moves back and forth over the detector element in a strange sort of dance to perform the scan.

PC MAGAZINE FACT FILE

IBM 3117 Scanner
IBM Corp.
Old Orchard Rd.
Armonk, NY 10504
(800) 447-4700

List Price: $1,095; IBM 3117 PC Adapter, $240; IBM 3117 Extension Unit, $700; IBM PC Cable, $65; IBM High-Speed Adapter, $295; Image Support Facility 2, $95; PC Image Document Utility, $240; *ImagEdit*, $395.

Requires: 384K RAM (640K RAM recommended), two disk drives (hard disk recommended).

Supports: Hercules monochrome graphics adapter, IBM CGA, EGA, and VGA; IBM dot matrix, ink jet, and laser printers; Microsoft-compatible mice, IBM PS/2 Mouse.

In Short: A single-sheet scanner with a flatbed design, this scanner, one of two similar devices offered by IBM, will handle originals up to 5 pounds, adapts to a number of different interface cards, and can use both of IBM's software packages for scanning; no OCR support is available yet, but it is expected soon from a third party.

CIRCLE **631** ON READER SERVICE CARD

IBM provides several ways to connect the flatbed IBM 3117 Scanner to your PC. You have your choice of hooking the two through a serial COM port, through a special serial interface, or with a plug-in short card designed especially for the task.

This method slightly limits the weight of the original that the 3117 will scan (IBM rates it at 5 pounds), but it's nevertheless better than the platen roller method. And despite its antics, the 3117 is perfectly quiet in operation.

IBM 3118 The 3118, in contrast, uses the platen roller method. While limiting the scanner to single-sheet input, this method has the advantage of using an input hopper capable of multiple pages. Able to handle up to 50-pound paper stock, the 3118 had no trouble digesting even standard Kodak prints.

IBM supplies two software packages, which work equally well with either of the company's scanners in any of their interface configurations. The Image Document Utility (IDU) is a simple image-scanning package with good preview but little editing capability. *ImagEdit* is a more or less conventional paint program common to the IBM scanners.

The IDU software is unusual, since it runs under BASICA and supports both 3½- and 5¼-inch floppy disk formats as well as the new VGA and Model 30 MGCA display adapters. In use, the IDU has a "rude-and-crude" feel, much like software from an earlier era. Commands are via function keys, with a menu describing the legal choices. To scan an image, you select the command Source (not exactly an intuitive choice) and then answer a series of questions concerning density, margins, and the like. Four different 4 by 4 dither patterns are available as one of the selections, each optimized to a different type of image.

Unfortunately, the IDU does not store these selections from one scan to the next, requiring you to answer the questions each time. You can apparently use a rudimentary macro language to set up scanning scripts. Using that method, an experienced scanner user might set up a command string that would make all the appropriate choices for less-sophisticated scanner users to rely on. A menu of options that you could save and reload would be much easier to use.

IBM offers an enhanced option in the 3118 Scanner Model 20. Unlike the 3117, the 3118 is a platen-fed machine that has the added feature of an input hopper that can handle multiple text and graphics pages at paper stock weights of up to 50 pounds.

FACT FILE

IBM 3118 Scanner Model 20
IBM Corp.
Old Orchard Rd.
Armonk, NY 10504
(800) 447-4700

List Price: $2,750; IBM 3118 Scanner Model 10 (without Automatic Document Feed), $2,350; IBM Communications Cable, $65; PC-AT Serial Adapter Cable, $65; IBM High Speed Adapter, $295; Image Support Facility 2, $95; PC Image Document Utility, $240; *ImagEdit*, $395.

Requires: 384K RAM (640K RAM recommended), two disk drives (hard disk recommended).

Supports: Hercules monochrome graphics adapter, IBM CGA, EGA, and VGA; IBM dot matrix, ink jet, and laser printers; Microsoft-compatible mice, IBM PS/2 Mouse.

In Short: This multisheet scanner, one of two similar devices from IBM, uses a platen feed unit, adapts to a number of interface cards, and can use both of IBM's software packages for scanning; no OCR support is available as yet, but it is expected soon from a third party.

CIRCLE **630** ON READER SERVICE CARD

PAINT PROGRAM *ImagEdit* is more similar to other paint programs. It includes the typical cut-and-paste commands, as well as the scan commands. *ImagEdit* can scan portions of an image, something the IDU apparently cannot do. *ImagEdit* also allows you to set up preferences in menus so that you can avoid answering the same questions on every scan.

Because of the large amount of data contained in graphics images, all the paint programs we tested were slow, but *ImagEdit* was absolutely glacial in loading and storing images. Much of this slowness seems to be due to *ImagEdit's* complicated compression techniques, used to reduce the size of the stored graphics images. IBM claims that its Modified-Read technique typically achieves a 27-to-1 reduction in storage requirements over uncompressed text images.

> ■ Although the IBM 3117 and 3118 are not the best scanners, they are not the worst either.

To increase speed, you can turn off the compression. Once you've loaded the image, scanning takes place fairly swiftly.

The one advantage of the IDU is that, having scanned an image, it can display it almost in its entirety on the screen. On EGA displays, it can also scroll the image both vertically and horizontally to view what won't fit onto a single screen. This capability enables you to check images quickly before you continue. In practice, it's advisable to use the IDU to scan the image and quickly check it, then load *ImagEdit* to do any serious editing required.

No OCR support is available for either unit, although a third-party software solution should not be long in coming.

Programmer's Technical Reference manuals are available for both the 3117 and the 3118. These books detail everything you could possibly need to know about the scanners, especially if you intend to write your own software to interface with them. OEMs that want to interface directly with either the 3117 or the 3118 should have few problems with these manuals in hand.

Although the 3117 and the 3118 are not the absolute best scanners on the market, these IBM offerings are certainly not the worst either. "True Blue" equipment buyers should have no cause for regret if they stay faithful to IBM when selecting a scanner.—**Stephen Randy Davis**

INTELLIGENT OPTICS CORP.

IOC Reader Model 400

The IOC Reader Model 400, from Intelligent Optics Corp. for $3,495, starts out simple enough. A little black, square box, it has an input hopper on top and an output hopper on the bottom. A 25-pin serial plug on its back connects the IOC Reader to either COM port of the host PC via the supplied cable. The scanner includes software to control it and a copy of *PC Paintbrush Plus* to edit the graphics.

When you set up the scanner's software, things get more complicated. As

frustrated
impatient
upset
tedious
dizzy
perplexed
crazy
dumb
outraged

aggravated
confused
perturbed
overwhelmed
defeated
stupid
annoyed
irate
foiled

sick
troubled
tired
miffed
agitated
wrecked
moronic
pained
thwarted

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Lotus Manuscript™

The IOC Reader Model 400 is equipped with an input hopper on top and an output hopper on the bottom. Rather than waiting for commands from the panel controls, the unit loads a page as soon as it detects the presence of paper in its input hopper.

with so many scanning programs, the IOC Reader installation program messes with your CONFIG.SYS file. Fortunately, you can recover the original file and make the desired additions manually. The installation program conveniently allows you to install the IOC software in any hard disk subdirectory.

After you install the IOC Reader software, you must install *PC PaintBrush Plus*. Fortunately, to help keep things simple, you can put the editing program in the same directory as the IOC Reader software.

All control of the IOC Reader takes place through software. In the IOC Reader program, you select the initial function by entering two-letter commands. You can often make subsequent selections by moving the cursor to the desired field and entering the proper data. A menu of options prompts you at each step.

SOFTWARE The IOC Reader software gives you a great deal of control over the scanning operation. To customize each scan you're performing, it poses different sets of questions tailored to the options you've chosen. One useful selection enables you to select the size of the dither, to opt for either better tonal rendition or better fine-grain resolution.

Although it's a bit rough in appearance, the IOC Reader software works reasonably well except in one important respect: its clumsy interface to *PC Paintbrush Plus*. After the scanner has scanned an image, you edit it by first entering *PC Paintbrush Plus*, and doing so is a time-consuming operation.

Once you're in *PC Paintbrush Plus*, you must tell it to reload the disk file that the IOC Reader software created in the previous step. This operation, too, takes a great deal of time.

Worse yet, when you exit *PC Paintbrush Plus*, you're dropped back into DOS, not into the IOC Reader software as expected. In addition, when you've installed *PC Paintbrush* for use with a mouse, the IOC Reader software won't work properly unless you remember to turn the mouse software off before reentering the program. To make its product easier to use, Intelligent Optics should improve the integration of the interface between the scan and the edit operation.

In actual scanning, the IOC Reader is slow. Limited by the data rate of the serial interface, it takes a long time to scan images of any size at the higher densities (it can scan at up to 400 dpi). Limiting the size of the scanned area by specifying appropriate margins helps significantly.

OCR CAPABILITY The IOC Reader, as the name implies, has a built-in OCR capability. In addition to being able to generate straight ASCII files, the device can produce files that are compatible with most of the more common word processors.

The same software interface that handles scanning performs character reading. At each step the software informs you of

PC MAGAZINE FACT FILE

IOC Reader Model 400
Intelligent Optics Corp.
P.O. Box 712
Clinton, CT 06413
(203) 669-3650
List Price: $3,495
Requires: 256K RAM, one disk drive, asynchronous port.
Supports: AT&T 6300, AT&T DEB, ATI Graphics Solution, Hercules monochrome graphics adapter, IBM CGA, EGA, and PC*jr*, Micro Display Systems Genius VHR, Persyst BOB, Plantronics ColorPlus, Profit Multigraph II, Quadram Quadcolor, Sigma Color 400, STB Systems SuperRes, Tecmar Graphics Master, Tandy 1000, 1200, and 3000, Tseng Labs Monochrome and EVA 480, Wyse WY-700, Xerox 6065, Video 7 Deluxe; dot matrix, ink jet, and laser printers; Microsoft-compatible mice, AT&T 6300 keyboard mouse, MindSet Mouse, Hewlett-Packard Vectra mouse, Key Tronic KB5153 Keyboard, GTCO DigiPad, Kurta IS/ONE Series Tablet, Kurta Pen Mouse, Summagraphics SummaSketch and compatibles, Hitachi Digitizing Tablet, Scriptel Digitizing Tablet, Honeywell microLYNX trackball.
In Short: IOC uses the same software interface for scanning and character reading. It has a poor user interface and its input bin feed makes aligning pages difficult.

CIRCLE **629** ON READER SERVICE CARD

the progress of the read operation. It does not, however, print the text of what is being read, nor does its menu include a Type option. You must exit the program just to type the text file to the screen. After you check the file, you then reenter the IOC Reader software to scan the next document. The entire process takes more time than it should.

As for the scanner itself, the design of the unit's document feed is disconcerting. As soon as the scanner detects the presence of pages in its input hopper, it loads the first page, rather than waiting for a command sent from the IOC software or via a button on the front panel. This method makes proper alignment of pages difficult, since the scanner immediately grabs whatever you give it. A less-than-ideal paper guide exacerbates the problem.

The hasty loading of the pages may account for some of the poor performance of the IOC Reader's OCR capability. It certainly accounts for some of the "jaggies" on the graphics the scanner generated.

The IOC Reader Model 400 would fare better against its competitors if Intelligent Optics added a good user interface and modified the input hopper. But as it stands now, a good number of scanners on the market can outclass the IOC Reader in both performance and ease of use.

—Stephen Randy Davis

I-SYS TECHNOLOGY INC.

I-SYS 101
I-SYS 102

OCR-only systems are getting rarer these days, but they are still being made and sold. Traditional OCR focused on document scanning as a conversion tool from paper to the PC, part of the transition to a "paperless office." A typical configuration was an OCR connected to a PC, which was used as a station by a variety of users in a busy office.

I-SYS Technology is a new player in the OCR market, with one unit—the I-SYS 101—based on the OCR-only TR-100 from the erstwhile Hendrix Technologies and a second, OCR-only unit based on Panasonic hardware, the I-SYS 102.

One of the best OCR-only systems was Hendrix Technologies' TR-100, which *PC Magazine* reviewed in the July 9, 1985 issue (see "Midrange OCRs: Reliable and Reasonably Priced," *PC Magazine*, Volume 4 Number 14). The TR-100 used a unique document-formatting scheme that made it compatible with virtually any word processor available. Hendrix left the scene, but I-SYS Technology acquired the rights to this OCR and rechristened it the I-SYS 101. The system is virtually the same as the one reviewed in 1985, with the exception of a new peripheral.

I-SYS 101 At $6,995, the I-SYS 101 is a substantial piece of hardware. The shipping carton required two people to handle it, and I found unpacking it no mean feat either. You'll need a cart, table, or very long desk to hold it because the footprint is 2 feet square—the biggest of all the scanners reviewed. Once you've got the scanner in place, installation takes just a few minutes. The I-SYS 101 connects to any available communications port on your PC and can use most communications software to receive text.

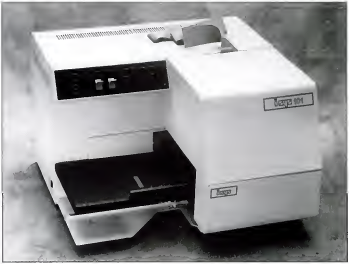
Paper is fed into a bin on the front and passes through a semicircular path beneath the input tray. A door allows easy access to the paper path to clear jammed sheets. The bin holds up to 50 sheets and tips down easily to load paper. The OCR control panel is located above the paper-feed area. The switches include one bank of format and control switches, and a second with the Read and Reset switch.

FACT FILE

I-SYS 101
I-SYS Technology Inc.
19151 Parthenia, Suite E
Northridge, CA 91324
(818) 886-9303
List Price: $6,995
Requires: Communications port, communications software.
In Short: An OCR-only system that reads in formatting data from header sheets before the recognition phase. Standard monospace OCR capability is a tabletop model that looks outdated but offers better recognition than some newer systems. Not to be overlooked.

CIRCLE **628** ON READER SERVICE CARD

Formatting options are selected using a header sheet. This page contains ASCII-encoded formatting instructions that the



The I-SYS 101 is based on the TR-100 from Hendrix Technology. The unit, which has a 2-foot-square footprint, has a bin that can hold up to 50 sheets of paper. A door on the unit provides easy access to the semicircular paper path to clear jammed sheets.

Q. HOW MANY LAPTOP COMPUTER COMPANIES DOES IT TAKE

to give you the largest laptop selection, expert, non-biased laptop information, all the laptop peripherals you need to be "up" immediately, authorized laptop service, free delivery, and a full laptop 'No-Lemon'† replacement guarantee above and beyond that of the manufacturer?

A. ONE*

	Bondwell Model 8	Spark by Datavue	Snap 1 + 1 by Datavue	NEC Multi Speed	Toshiba T3100	Toshiba T1100 Plus	Wang Laptop	Zenith Z-183	Zenith Z-181
Micro processor	80C88	NEC V20	80C88	NEC V30	80286	80C86	NEC V30	80C86	80C86
Screen Type	supertwist LCD	supertwist LCD	supertwist LCD	supertwist LCD	Gas Plasma	supertwist LCD	LCD	backlit supertwist LCD	backlit supertwist LCD
Hard Drives	–	–	1 20M-byte	–	1 10M-byte	–	1 10M-byte	1 10M-byte	–
Internal Memory	512K	384K	640K	640K	640K	640K	512K	640K	640K
Battery Duration Time	6 to 8 hours	8 hours	8 hours	4 to 8 hours	Call for Avail	8 hours	4 hours	2 hours	3 hours
Clock Time (MHz)	4.77	4.77 or 9.54	4.77	4.77 or 9.54	4 or 8	4.77 or 7.16	8	4.77 or 8	4.77 or 8
Number of Floppy Discs	1	1	1	2	1	2	1	1	2

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BONDWELL Model 8

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OUR PRICE
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ZENITH Z-181

Perhaps the best laptop value available today, this is the laptop the competition would like to forget!! A switchable clock speed, a large, adjustable screen for super sharp images, full 640K memory, and dual 3.5" pop-up drives are packed into a fully portable unit that weighs less than 12 pounds. Compatible with the IBM PC & XT, the Z-181 puts the weight of your work on its shoulders, instead of in your lap.

LIST PRICE
$2399
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ZENITH Z-183

Easily upgradable, this is the laptop that gives serious users all they need. An internal 10 MB hard disk, dual speed processing, and 640K RAM plus EMS expansion capability to 1.6 MB gives the Z-183 the edge over the competition. Add these to an adjustable backlit Super Twist LCD screen and a long-life rechargeable battery, and suddenly the Z-183 doesn't really have any competition...

LIST PRICE
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OUR PRICE
$1209

SNAP 1+ 1 (Not shown)
LIST PRICE
$3495
OUR PRICE
$2999

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CIRCLE 270 ON READER SERVICE CARD

■ Operating the I-SYS 101 is simple. You start your communications software, open a log file and start feeding the scanner pages.

OCR scans and stores in a buffer. Any sheet fed through the scanner is formatted according to the header sheet instructions. You can change formatting instructions as quickly as you can load the sheet into the reader.

Operating the I-SYS 101 is simple. You start your communications software, open a log file, and start feeding the scanner pages. The I-SYS 101 performs all OCR operations inside the scanner, then sends the results to the communications software and into the open file. You can scan as many sheets as you like during a session into a single file.

I used the *WordStar* header sheet and one log file to scan the samples, and the I-SYS 101 did an excellent job on the faces it knew, which include Courier, Pica, Prestige, and OCR-A/B in 10 and 12 pitch. Most of the dot matrix samples failed, although the 24-pin letter-quality sample was recognized well enough. After scanning I edited the file and found that most of the conversion worked perfectly, particularly indents and tabs. I-SYS 101 does not like vertical rules, and it skipped over the boxed table after a few attempts. The spreadsheet fared better than expected, although the header sheet seemed to have misplaced my underlines. The sheets will take some work to understand, but they provide an excellent level of document compatibility. Overall, the I-SYS 101 performed well on OCR, with one of the best error rates on our Courier sample: 0.16 percent, or 1 out of 600 characters.

The I-SYS 101 also offers a handy option called the Margin Module, a box that lets you control margin settings without using a header sheet. The Margin Module, like the rest of the I-SYS 101, is not small, and it combines a switch, dial, push-button page counter into a rugged, if dated, configuration. I found it came in handy on the multicolumn samples, but otherwise I used it infrequently.

The I-SYS 101 has been eclipsed by the 102, a smaller and more complete system that supports graphics scanning and forms processing but not these vaunted header sheets. I'm sorry to see that, because for someone who needs flexibility in formatting OCR, the header sheets used on the I-SYS 101 have much to recommend them. Perhaps next year.

PC MAGAZINE FACT FILE

I-SYS 102
I-SYS Technology Inc.
19151 Parthenia, Suite E
Northridge, CA 91324
(818) 886-9303
List Price: $5,995
Requires: 256K RAM, hard disk drive.
Supports: Hercules monochrome graphics adapter, IBM CGA and EGA.
In Short: Extraordinary hardware interface for rather ordinary monospace OCR capability. However, the forms-processing software, which scans and stores data from predefined areas, is the best feature on this system.

CIRCLE 627 ON READER SERVICE CARD

I-SYS 102 The I-SYS 102 runs at 240 dots per inch (dpi) instead of the preferred resolution of 300 dpi.

The I-SYS 102 takes the prize for the biggest and most complicated interface board I've seen to date. This monster takes up two slots and is a piggyback design with three plastic offsets and a fragile pin connector block. My first board arrived with four bent pins that snapped the instant I tried to straighten them, although I-SYS quickly provided a replacement. The boards were fairly easy to install, but they took up all the remaining room I had available in my PC.

Installation is simple enough: you plug in the boards, connect the scanner, make a subdirectory and copy three diskettes onto your hard disk. The package I received, which was an early shipment of the prod-

A Panasonic scanner built on a Panasonic engine, the I-SYS 102 comes with a large, two-slot interface card. The 102's features include a paper-feed tray with adjustable guides and a small LED status display built into the front panel.

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uct, also requires you to change the lamp on the scanning engine. (The company explained that the lamps on the scanning engines of the earliest shipments did not filter out certain undesirable colors. Currently, the scanners are being shipped with the correct lamp already installed.) Once installed, you use the OCRMENU software to control all scanning operations.

The menu interface is easy to use, but somewhat slow in responding to selection changes with the arrow keys, resulting in a lot of type-ahead problems in which the highlighted item hadn't caught up with the Arrow key. The menu is divided into three main areas: Scanning, Setting, and Tools. You can use single keys to call up menu items within one of the three areas, but if you're in Settings and you want to use an option in Tools, you must arrow over to highlight it before you can select the option. The function keys do allow some shortcuts, but overall the menus are not that easy to use.

> ■ The I-SYS 102's forms processing, which is quite good, is overshadowed by an obtuse menu and nonexistent documentation.

The Settings menu lets you define the type of PC you're running, as well as the graphics card, and you can also define page margins, OCR options, and other settings. You also must run diagnostics after you install the system, a relatively simple procedure as long as you use auto-test mode. The remaining options require you to enter nasty-looking hexadecimal codes for ports, masks, and so on. There is the potential for users to go in and actually modify these settings under a submenu option called NINA, although the I-SYS displays warnings in these menus.

Operating the I-SYS 102 is fairly simple. You select the OCR option, load up to 30 pages into the scanner, enter an output filename, and you're off and running. If you get lazy and use the default output filename, you'll pay for it, since even an error will cause the I-SYS 102 to overwrite this file—an irritating quirk that caused me to rescan samples several times.

The Panasonic engine has several controls on the front panel, as well as a small status LCD. The paper-feed tray includes adjustable guides and an output tray for the bottom, and the front cover opens up like a clamshell so that you can clear the paper path. None of these options are described in the documentation, but they're available.

TESTS The I-SYS 102 did not do as well as I expected on the various fonts we tested. The opening letter, in Courier 10, had 8 errors out of 600 characters, or a 1.3 percent error rate. That sounds small until you consider that other scanner systems that had OCR options had a much lower error rate. The remaining Courier samples fared even worse: one had 7 errors out of 220 characters, for a 3.1 percent error rate. The I-SYS 102 could not read most of our dot matrix fonts except the 24-pin letter quality, so it seems limited to the standard library of letter-quality fonts. Overall I found the character-recognition feature rather lackluster.

One option lacking in most other OCRs is a built-in forms-scanning option. This is the saving grace of I-SYS 102, although it is not the easiest option to use. Using tracing paper with a grid, you define windows on the form where you want to scan. The form is scanned into the system and associated areas are tagged for later use with a scanning form file. Once defined, you can load the window and scan a form. The software reads data from the windows and sends it to a file along with the associated window tag. I used the I-SYS samples and had no problems, then started looking for samples of my own. I defined a fairly simple form—a Federal Express airbill—and loaded my definition, then scanned some typewritten airbills. Except for one error, which was my mistake, the forms scanning worked well, almost better than the plain OCR.

The I-SYS 102 seems more like a prototype than a real product. The documentation consisted of a scant 13 pages—including two pages photocopied from the Panasonic manual—that in no way begin to cover the options. Overall, I found the I-SYS 102 a rather clumsy system that would benefit from a more reasonable user interface and better performance. The forms processing, which is quite good, is overshadowed by an obtuse menu and nonexistent documentation. The OCR option produces more errors than I like to see, and I suspect there may be ways to improve it. This and other design issues in both the hardware and software need swift resolution before this product can be recommended.—**Tom Stanton**

KURZWEIL COMPUTER PRODUCTS

Kurzweil Discover 7320

Until recently, an OCR that could read typeset text cost $40,000 and took some convincing arguments to justify. But the Kurzweil Discover 7320 system, selling at just $9,950, now provides that same capability at a quarter of the cost. Though it's hardly perfect (and no OCR is), the Kurzweil Computer Products alternative goes a long way toward making real OCR affordable—and leaves its competition in the dust.

SECOND COMPUTER The Discover system's full-length expansion card is effectively a second computer in itself. The card is equipped with a Motorola 68020

PC MAGAZINE
EDITOR'S CHOICE
FACT FILE

Kurzweil Discover 7320
Kurzweil Computer Products, a Xerox Co.
185 Albany St.
Cambridge, MA 02139
(617) 864-4700
List Price: $9,950
Requires: 640K RAM, hard disk drive; XT, AT, or compatible.
In Short: The Discover brings to the desktop a way to scan typeset text at a fraction of the cost of other such systems. This OCR capability, coupled with the Discover's very serviceable graphics scanning, makes it a system to beat.

CIRCLE **626** ON READER SERVICE CARD

The Kurzweil Discover 7320 system uses a scanner that is based on the Ricoh SS30 scan engine. The system's power comes from an included expansion card equipped with a Motorola 68020 processor running at 16 MHz and up to 2 megabytes of RAM for storage and recognition.

processor running at 16 MHz, so no matter which PC you own, you get full 16-MHz performance; it also has 2 megabytes of RAM (expandable to 4 megabytes) for storage and recognition. With this card, you can scan text or graphics in the background while you're busy with other applications. Disk I/O and screen refresh will affect the system's performance, and I noticed some changes running Discover in the background on long documents. Still, I'm using an antique 4.78-MHz system with a slow hard disk; an AT or a turbo clone might do much better.

Installing the hardware and software takes a few minutes, but if you want to change the configuration you'd better get out your table of hex and ASCII codes. Keep it out—you'll also need those values to change text formatting codes. With a little work, you can configure Discover to dump almost any code into a text file for word processing. Discover also lets you save the format settings for a particular word processor or application and load them as needed.

The Discover software takes up over a megabyte of disk space but consumes only 16K of RAM while it's running. The menu system uses Arrow keys or one-letter commands to select options, with the major scanning operations controlled on the PC function keys. Discover lets you define and store document, page, and textual formatting of spaces, tabs, centering, and indents, as well as page dimensions and scanning windows. You can also store the name of a callable editor or communications program to edit or transmit documents. All settings can be saved to configuration files, loaded, and altered as needed to suit individual documents.

The Discover system uses the Ricoh SS30 scan engine. The scanner has a simple paper path and an adjustable bin that accepts pages from 5½ to 10½ inches wide (page length is programmable). You can scan single sheets or a stack of pages up to ¾ inch thick. I stacked all the samples except multicolumn into the bin, started the scanner, and walked away; 10 minutes later I had a file scanned and converted, with all samples formatted and ready to edit. To test Discover's performance in the background, I next loaded up 50 pages from a typeset user manual and started writing this review while Discover scanned the pages. Except for a few minor slowdowns, Discover and I worked together well.

OMNI-FONT Kurzweil calls Discover not OCR but "ICR"—Intelligent Character Recognition. That's another way of saying true omni-font capability: Discover scans any mix of type sizes from 8 to 24 point and any mix of fonts on a page except for script or decorative faces.

That's not to say it makes no errors. After a full morning of scanning, I converted the files to text format (you can also convert to DCA or NNN). Later examination revealed mistakes in most of them, sometimes in rather common fonts such as Courier 10. For example, the opening letter had 15 errors out of 600 characters, pretty high for any OCR—and that didn't include the mistakes made trying to scan the letterhead. Discover seems to need a fair amount of information about characters; our 9-pin draft sample was virtually unreadable, but as the quality of the original improved, accuracy increased. The Times Roman sample and other typeset materials scanned with the fewest errors, and 12-point Century Schoolbook Light scanned with no errors at all. I used default settings on most samples, but I also tested various combinations of contrast, a short user-defined lexicon, and a high "assurance level" setting. Though the last feature slows things down, it delivers much more accurate results.

■ Until recently, an OCR that could read typeset text cost $40,000. But Kurzweil's Discover 7320 system now provides that same capability at a quarter of the cost.

Discover can be set up to scan single-column pages automatically. The user manual I scanned took 20 minutes, but the system ran unattended during the entire period and the resulting file had only a few character errors. Multicolumn scanning

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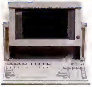

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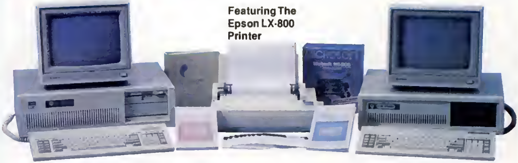

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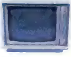

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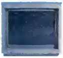

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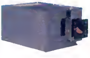

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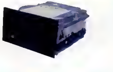

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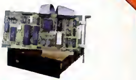

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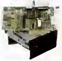

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must be done in one pass per column. Since Discover leaves a temporary file open for OCR, however, you can continue to scan various areas on any page in the document.

GOOD GRAPHICS Though quite ordinary compared with its OCR capabilities, Discover's graphics scanning measures up to that of most scanners reviewed here. You can choose resolutions of 180, 200, 240, or 300 dots per inch, select a window, and scan in what Discover calls binary mode (line art) or using random dither or spiral dither for continuous tone. Discover lets you save to *PC Paintbrush Plus* format or to TIFF; it also offers .RES, a proprietary format used with Xerox publishing products. Neither gray-scale control nor graphics editing is built into the system, so you must scan and save the image, then use a paint graphics editor to find out how you've done. I mostly managed to enter the correct window setting and had decent alignment on line art, but I would have preferred a preview mode and a temporary file in case I wanted a change.

There's no machine quite like the Discover. While it isn't infallible for lower-quality type, it does an excellent job on typeset characters and offers extensive formatting (albeit requiring a working knowledge of ASCII codes). Even though the Kurzweil Discover 7320 is priced 75 percent below other machines with similar capabilities, I'm often asked if it's really worth $9,950. My answer: look at the applications. Desktop publishers can use it to scan and re-create books, articles, or virtually any other typeset material. Databases can expand their offerings of published material, at a lower price. Libraries and other archivists also have a vested interest in such conversion. The list of uses is as long as you dare to make it.
—Tom Stanton

THE LASER CONNECTION

TLC IS-300

The Laser Connection's TLC IS-300 is a compact and inexpensive ($895) sheet-fed scanner suitable for general-purpose scanning duty. Essentially, this impressive device is a Canon IX-12 in The Laser Connection garb.

The TLC IS-300 is a relabeled Canon IX-12 that depends largely on software to control the scanning process. The TLC IS-300 scanner can use either a Jlaser Plus card or The Laser Connection's own optional TLC Scanner Interface.

The TLC IS-300 comes with no interface card and no software. It allows you some flexibility in your choices, but you must make sure you either have or can afford the additional hardware and software you'll need.

■ The Laser Connection's TLC IS-300 is fast and produces consistently good results.

The scanner can use either a Jlaser Plus card or The Laser Connection's TLC Scanner Interface Card, which TLC sells, with a cable, for $250. The TLC Scanner Interface Card is identical to the Canon A200-IX2IF interface.

AVOIDING CONFLICTS The TLC card, which we used for our tests, conflicts with an EGA in the system—an awkward design for a graphics-oriented device. If you have an EGA, you must change some jumpers on the interface board. What's worse, you must run a program that changes the address and the interrupt vector specifications every time you want to use the scanner.

If you're technically inclined and comfortable with hex numbers, you'll be able to figure out one of the two parameters this command requires from The Laser Connection's manual, but the manual doesn't give you any clue as to what the second parameter should be. In fact, the second parameter isn't really necessary. Worse, there's a serious typo in the manual: a missing slash. The program won't work without it.

The manual suggests using a certain jumper setting with an EGA, but the setting didn't work with our test system, possibly because we were using a Tseng EVA 480 card, which offers 640- by 480-pixel resolution and may use memory not required by a standard EGA. We got our video to work by using a higher address setting.

The scanner itself is surprisingly heavy

■ The Microtek MS-300A gives you control over the grain pattern of your image, and features a fast, versatile scanning package that operates under *Windows*.

and solid for such a small unit. Its compact size is a plus for crowded desks, but it should stand up to commercial use with no problems. Its simple, controlless visage is appealing and straightforward.

Software controls the entire scanning process. The Laser Connection suggested we use ZSoft's ***Publisher's Paintbrush*** software with the TLC IS-300. This popular program installs easily and supports a long list of video adapters, printers, plotters, and scanners.

Publisher's Paintbrush requires 512K bytes but works faster and handles larger images with EMS expanded memory. ZSoft supplies a software EMS simulator for those with AT extended memory. Such programs have a reputation for flakiness, but the ZSoft EMS emulator worked perfectly on our test AT equipped with 3 megabytes of extended RAM.

Once we had installed *Publisher's Paintbrush*, we tried a 300-dot-per-inch test scan. We received error messages about full disks, even though our hard disk had about 4 megabytes free. The problem turned out to be that we had installed *Publisher's Paintbrush* for 16-color EGA. The program then tried to scan in color and created a temporary work file on disk that was over 4 megabytes. It turns out that if the program scans an image in color mode—even though it appears on the screen as black and white—the image actually has room for 16 levels of color, which you can paint in by hand.

An expedient solution is to run *Publisher's Paintbrush* in two-color or monochrome mode. A call to The Laser Connection's competent technical support staff solved these problems quickly.

SMOOTH SCANNING From then on, the actual scanning tests proceeded smoothly and pleasantly. The scanner fed out the PC Labs test samples with no jamming or other problems. The TLC IS-300 is fast and produces consistently good results.

Publisher's Paintbrush does a good job of controlling the scanner, with a minimum of fuss and bother. It makes the scanning process go fast and easy.

The software lets you control brightness over three levels, and you can choose either a line art or dithered mode. We found that the default settings worked well and proved to be the optimum values for our test materials.

You can specify the scan area by entering the left, right, top, and bottom margins in either inches or centimeters. There are no enlargement or reduction modes, though.

Once you've scanned an image, you can use *Publisher's Paintbrush's* ample assortment of drawing and editing tools to enhance your image. It's a first-rate program, with sophisticated features designed for both beginners and advanced users.

Although the TLC IS-300 is one of the lowest-cost true scanners available, you make few compromises of any consequence when you use it. It produces good results fast and easily. Remember to factor in the cost of an interface card and your choice of software, since the scanner gives you the flexibility of choosing your own. We found that ZSoft's *Publisher's Paintbrush* and The Laser Connection's TLC IS-300 make an impressive team.
—Glenn A. Hart

PC MAGAZINE FACT FILE

TLC IS-300
The Laser Connection
7852 Schillinger Park West
Mobile, AL 36608
(205) 633-7223

List Price: $895; TLC Scanner Interface Card and Cable, $250.

Requires: TLC IS-300 Scanner Interface Card and Cable or the Jlaser Plus card; graphics software package with drivers for the Canon IX-12.

In Short: A truly inexpensive sheet-fed scanner suitable for general-purpose scanning duty. This impressive device is a Canon IX-12 in The Laser Connection garb, and it produces good results quickly and easily.

CIRCLE 625 ON READER SERVICE CARD

MICROTEK LAB INC.

Microtek MS-300A
Microtek MS-300C
Microtek MSF-300C

No matter what you're looking for in a scanner, look at one of the three units offered by Microtek Lab. The company manufactures two roller-fed models for pages up to 8½ by 14 inches and also produces a flatbed unit that can read text and graphics from larger, more cumbersome originals. One of these units could well have what you need.

MICROTEK MS-300A The MS-300A offers uncommon flexibility. The $2,495 system has a multitude of fine-tuning adjustments, gives you control over the grain pattern of your image, and features a fast, versatile scanning package that operates under *Windows*. The upshot? Clean images and saved time.

The scanning unit itself is about the size of a small single-sheet copier. You feed documents into rollers at the top through a single-sheet paper guide or an optional automatic sheet feeder. Installation is easy: just set one DIP switch on the interface board and run a configuration program. Hardware compatibility shouldn't be a difficulty, as the latest version of the software supports everything that *Microsoft Windows* recognizes. I tested the MS-300A on an 8-MHz AT with an EGA monitor and an HP Laserjet Plus. Once the Microtek system was correctly configured, I had no hardware problems at all.

In scanning one always wants as much disk space as possible given the storage requirements of scanned images. The software that runs the MS-300A doesn't take loads of room in itself; all programs are packaged on only three floppy disks. Also, each Microtek system reviewed here has a

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CIRCLE 510 ON READER SERVICE CARD

Many manufacturers buy and relabel Microtek units because the scanners, and their software, offer a great deal of control over the final images. The Microtek MS-300A is one of the company's two roller-fed models with a footprint the size of a small single-sheet photocopier.

neat compression feature, allowing you to squeeze down image files by up to 90 percent to save space. You should be aware, however, that on the MS-300A and other Microtek scanners, some operations require lots of disk space for temporary and other files. What's more, the error messages that crop up sometimes don't clearly indicate that disk space is the problem. If something isn't working or is only being partially finished on your Microtek system, check your hard drive space first. You should try to keep at least 2 megabytes free.

You control all operations through software: *EyeStar Plus* (which runs under *Microsoft Windows*) for scanning and editing images, *ReadRight* for OCR. *EyeStar Plus* was fairly easy to learn, particularly because of the *Windows* environment and the manual, which includes a tutorial and a clear explanation of the features.

The MS-300A successfully scanned all of our samples, although it couldn't, of course, do more with the color wheel than interpret it as shades of gray. The process is simple: you position the original in the feeder, set the desired characteristics in the Attributes menu, and start scanning. You can work with line art, halftones, or mixed materials. The MS-300A lets you select from 14 levels each of contrast and brightness (the default settings for each were just right for everything I scanned). From this same screen, you can scale the image, moving anywhere from 25 to 100 percent in 5-percent increments. Another nice feature lets you determine the grain to be used in the dots on the screen. To do so, you turn elements in an 8 by 8 grid on or off using the mouse. One of the most impressive things about this process is how it works dynamically: if you already have an image scanned, you can watch it change as you change grain patterns.

TWO VIEWS Once an image is scanned you see it in two views. The first, called Reduced View, shows a scaled-down version of the image in a foreground window. Normal View, in the background, gives you full editing capabilities down to the dot level and displays images in full resolution. A "magnifying glass" tool in Reduced View lets you change which portion of the image appears in Normal View. Reduced View has other tools as well, including a cropper to set a new window for saving or printing. You can move or even completely hide the Reduced View window, but it's so convenient you'll probably spend most of your time working in it.

To select only a part of the whole, you can draw a box around a particular section of the image using a mouse. Microtek gives you a neat alternative, however: you can use commands to set up a box of a specified size and then move the box to a specific area using the mouse. For example, if you're in 300-dot-per-inch resolution, you can choose an area of 600 dots by 600 dots to set up a two-inch square. This ability to select absolute size is terrific if you need to lift a part of an image to fit in a precisely sized rectangle.

ReadRight, the system's OCR package, is a $595 option, so if you don't do OCR work, you don't have to pay for or install the software. A separate environment from *EyeStar Plus*, *ReadRight* does not work in the *Windows* environment but can be called up by *Windows* if you have 128K bytes in either extended or expanded memory above 640K. I did not test *ReadRight* with *Windows*; instead, I used the program's own simple menu system, helped by an adequate 32-page manual.

ReadRight is especially simple since it doesn't work by setting fonts. This system

PC MAGAZINE FACT FILE

Microtek MS-300A
Microtek Lab Inc.
16901 S. Western Ave.
Gardena, CA 90247
(213) 321-2121
List Price: $2.495; automatic document feeder, $295; *ReadRight*, $595.
Requires: 384K RAM, two disk drives (hard disk recommended).
Supports: All graphics cards, printers, mice and pointing devices supported by *Microsoft Windows*.
In Short: The Microtek MS-300A is a superb unit for both image scanning and OCR. It scans cleanly, with multiple fine-tuning adjustments. The scanning software, running under *Microsoft Windows*, is both quick and flexible.

CIRCLE **624** ON READER SERVICE CARD

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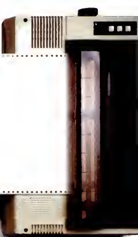

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CIRCLE 383 ON READER SERVICE CARD

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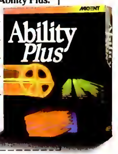

reads type in variable sizes between 10 and 15 characters per inch. The software uses general rules for character organization rather than working by direct pattern recognition; the results are fine with everything but draft-quality dot matrix print (it seems to have a problem with dots between parts of letters). Unrecognized characters are flagged with an @ sign for later correction.

When you use *ReadRight* for OCR, you can set a frame from the utilities menu that allows you to limit the area from which the scanner reads text. Two obvious uses are to skip letterheads and to separate text columns. If you don't use separate frames, the system reads multiple-column text straight across, preserving the spaces between columns but destroying the sequence of text in newspaperlike snaking columns. By setting frames and scanning the first column, and then resetting for and scanning subsequent columns, you can store text in its original sequential format.

ReadRight lets you save OCR files in ASCII, *WordStar*, or *WordPerfect* formats. The program also includes a utility that will convert a *ReadRight* ASCII file to seven other formats: *WordStar 2000*, *MultiMate*, *DisplayWriter*, *PFS:Write*, *PC-Write*, *Symphony*, and *Canonwriter*.

The Microtek MS-300C is very similar to the MS-300A. It, too, is a roller-fed model. The main difference between the two Microtek machines is that the MS-300C is slightly less flexible than the MS-300A. However, it costs $700 less.

MICROTEK MS-300C If you like the Microtek MS-300A but don't like its price, consider the MS-300C. At $1,795 this excellent unit costs $700 less than the MS-300A but gives you the same software and the same control over grain pattern. The only real difference between the systems is in the level of fine tuning for brightness and contrast that they allow.

PC MAGAZINE FACT FILE

Microtek MS-300C
Microtek Lab Inc.
16901 S. Western Ave.
Gardena, CA 90247
(213) 321-2121
List Price: $1,795; automatic document feeder, $295; *ReadRight*, $595.
Requires: 384K RAM, two disk drives (hard disk recommended).
Supports: All graphics card, printers, mice, and pointing devices supported by *Microsoft Windows*.
In Short: A single-sheet, roller-fed scanner/OCR system that has most of the control and flexibility of the more powerful MS-300A, for a lower price. Performance is competitive with that of similarly priced units.

CIRCLE **623** ON READER SERVICE CARD

Like the MS-300A, the MS-300C holds documents vertically with a paper guide for single-sheet feed; it can also use an optional $295 sheet feeder capable of holding 30 sheets of paper for long OCR runs. All operations are software controlled. About the only reason you might move to the scanner, other than initially putting in paper, would be to clear the very occasional paper jam. A large horizontal flap on the bottom front of the scanner completely releases the rollers, allowing you to extract even the thinnest documents without damage.

The MS-300C handles very well, just like its more expensive sibling. You can scan line art, halftones, and mixed documents; for the latter, you first scan the whole thing in halftone setting and then select areas for secondary scans. The lower-priced machine has three settings for brightness and contrast, compared with 14 fine-tuning levels for the MS-300A. The MS-300C also lets you scale images in only seven settings. However, while the MS-300A always operates in 300 dpi, the MS-300C allows you to set lower resolutions.

On both systems, I used the default contrast and brightness settings for all of my scanning work and set the resolution at 300 dpi. I noticed no difference in images scanned. Certainly the MS-300A probably deals better with a variety of original qualities. If you work with consistently good documents, however, I see no reason to buy the more expensive machine.

There are a few less important differences between the MS-300C and the MS-300A. For instance, the two systems use different interface cards. And just to be sure you don't use the wrong card with your scanner, the cables are different for the two systems. The MS-300C also uses a different version of the *ReadRight* OCR software; if you have both systems, don't mix the programs.

The *EyeStar Plus* and *ReadRight* docu-

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CIRCLE 179 ON READER SERVICE CARD

mentation provided with the MS-300C are the same as with the MS-300A. The only difference in installation is to alert *EyeStar Plus* to the model scanner in use so that it can allow the proper levels of brightness and contrast settings. I had a problem configuring the *ReadRight* software to work correctly with my computer but found the manufacturer's support staff very friendly, knowledgeable, and helpful.

A flatbed version of the MS-300C, the Microtek MSF-300C is somewhat larger than its roller-fed sibling. However, the two scanners use the same software, interface card, and scanning technology. Its 8½- by 14-inch scan bed allows scanning of large documents.

MICROTEK MSF-300C As the model name implies, Microtek's MSF-300C is a flatbed version of the MS-300C. It uses the same interface, software, and scanning technology as the other unit; it does, however, add two more brightness settings and eight halftone patterns to the MS-300C's already impressive array. If your main application is image scanning, particularly from large documents, the MSF-300C could do the trick.

With a footprint of roughly 16 by 24 inches, the MSF-300C is larger than Microtek's roller-feed scanners. The flatbed scanner also costs $200 more than the MS-300C. The main benefit for that extra money is the ability to read from a great variety of originals. The flexible top cover lifts off to allow placement of original documents or materials on the 8½- by 14-inch glass surface. During the scan, the originals stay still and the scanner's light travels the length of the paper area automatically. Thus, you can scan bound volumes without having to remove or copy pages. You can also place extra-large documents under the cover and scan one part at a time, combining them later through software. Further, the flatbed scheme lets you put several different items adjacent to one another and scan them all at the same time. You could, of course, use the *EyeStar Plus* software to combine images with successive scans, but being able to grab them in one pass is an advantage.

EyeStar Plus works exactly the same way with the MSF-300C as it does with the MS-300C and the high-performance MS-300A. The configuration program tells the software how many steps of various settings to allow, but otherwise the user is unaware of software differences. For OCR, the major difference between this scanner and its roller-feed cousins is that you cannot use an automatic document feeder to run several pages through unattended. You can combine pages into the same scanned file, but someone must be there to put down each new sheet. Otherwise, the unit shares the features of its stablemates.

WHICH TO BUY Except for some misleading error messages, I was impressed by the whole Microtek line of scanners. While they're quite similar, it's relatively easy to decide which machine to use, based on your primary application.

PC MAGAZINE EDITOR'S CHOICE

F A C T F I L E

Microtek MSF-300C
Microtek Lab Inc.
16901 S. Western Ave.
Gardena, CA 90247
(213) 321-2121

List Price: $1,995; *ReadRight*, $595.

Requires: 384K RAM, two disk drives (hard disk recommended).

Supports: All graphics cards, printers, mice, and pointing devices supported by *Microsoft Windows*.

In Short: The Microtek MSF-300C is a flatbed version of the MS-300C. This unit is ideal for scanning single sheets up to 14 inches in length, larger documents that won't fit through a roller-feed scanner, and bound documents.

CIRCLE **622** ON READER SERVICE CARD

If you plan to use the scanner primarily for OCR or if all your originals are single sheets measuring no more than 8½ by 14 inches, one of the roller-feed versions is in order. Whether or not you need the finer-tuned MS-300A depends on the variety and quality of the originals you intend to scan. If your originals are of reasonably good quality, then the MS-300C is probably more than sufficient—and costs $700 less than the MS-300A. The automatic document feeder will be a blessing with either of those units if you do much multiple-page OCR work. If, however, your primary application is image scanning, and if you need the ability to scan bound materials or oversized documents, then the MSF-300C is for you.

Actually, an office with enough applications for one of these systems can probably justify buying all three and throwing in an automatic document feeder to be used on either of the roller-feed units. The combined price, including three copies of *ReadRight*, would be less than $8,500—which, a few years ago, wouldn't have purchased anywhere near the scanning or OCR performance of even one of these units.—**Bruce Brown**

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RASTER-TO-VECTOR CONVERSION SOFTWARE

CAD converts are finding an easier, cheaper way to enter existing drawings created by hand into their systems: raster-to-vector conversion programs. We look at one pioneer and two newcomers.

Computer-aided design and drafting, or CAD, software is boosting the productivity of many professions and businesses. Declining hardware and software costs have drawn increasing numbers of architects, mechanical designers, interior designers, electronic engineers, surveyors, and others into the CAD fold.

Invariably, new CAD converts have a large number of existing drawings produced by hand. They can leave some of these drawings untouched, but what of the projects still under way, the symbols and building blocks used repeatedly, the old jobs that need changes, the drawings obtained from subcontractors—all the images that they need to enter into the new CAD system?

If you find yourself wondering how to change hand drawings into CAD drawings, you have three alternatives. You can simply draw the existing image into the computer by hand. The disadvantage of this solution is that you must be fully qualified in CAD or hire someone who is, which entails the cost of his reasonably expensive labor.

Alternatively, you can find someone with less CAD skill and experience (and a lower rate) to trace the old drawing onto a digitizing pad. But the results will usually need touching up by a qualified CAD user, and this method can actually cost more than drawing from scratch.

The third solution is to convert the drawing electronically via a scanner and conversion software. As you can see from the reviews in this issue, scanning hardware is plentiful. And the prices are reasonable (even for the large-size drawings common to CAD)—if a fair volume of old drawings will be converted at the CAD site.

The output of a scanner is basically a bit stream of values that represent the color or value of a small portion of the original image (most often 300 dots per inch). Usually, the value is binary and represents black versus white. The bit stream is organized into a fixed number of dots in a line; the image consists of a number of such lines. Since these lines are much like the lines in your television set, called raster lines, this form of representation is called raster.

CAD software, on the other hand, represents objects as vectors, or line segments. The trick, then, is to analyze the rasterized bit patterns, discern where vectors exist, and save the vectors in a form the CAD software accepts. Theoretically, if raster-to-vector software performs perfectly, the end result of the conversion will be a CAD file exactly equivalent to the original image.

As you might imagine, the conversion is far from a trivial task. Advances in pattern recognition and high-speed processing help the process to work, but the original image may consist of circles, solid areas, text, and other entities that don't particularly lend themselves to simple conversion. The result is that a converted CAD drawing still needs a touch-up by an experienced CAD user. Yet the conversion and touch-up process can be more cost efficient than either of the other methods, depending to some degree on the nature and complexity of the original image and the accuracy of the conversion software.

The first raster-to-vector conversion program available on microcomputers was Autodesk's *CAD/camera*. Two new entries recently have joined it, *ScanPro* from American Small Business Computers, the vendor of the popular low-cost CAD program *ProDesign II*, and *CADmate* from scanner manufacturer Microtek Lab.

CAD/camera

Autodesk's *CAD/camera*, a $3,000 package, is the original raster-to-vector conversion program, designed to work with the industry-leading *AutoCAD* program.

CAD/camera's new version is more sophisticated than its predecessor (see "Hardware: Firm Support For CAD," *PC Magazine* Volume 5 Number 5) in terms of what it searches for and the types of *AutoCAD* entities it can create. But although Autodesk has increased its program's sophistication, it neglected to add support for more hardware.

CAD/camera works only with scanners from Datacopy. Datacopy offers good-quality flatbed, roller-feed as well as camera-stand-type scanners. But support for more scanners would be welcome.

More seriously, *CAD/camera* works only with the Hercules monochrome graphics video adapter. You can run *CAD/camera* without Hercules graphics, but then you can't examine the image before scanning. Owners of $5,000 high-resolution color video systems are not apt to be thrilled with *CAD/camera*'s limitations, especially since *AutoCAD* works with dozens of video adapters.

CAD/camera splits the screen into four windows: one containing messages, a second showing a compressed view of the input image, a third magnifying part of the image, and a fourth giving status information. You can perform limited trimming of the input image prior to vectorization. Datacopy offers a software package called *WIPS* to extend the editing capabilities.

The program scans for both lines and solids, placing them on separate layers in the finished drawing. It can produce *AutoCAD* Traces (wide lines) or Polylines at your option. It attempts to extract small symbols and text from the input image, placing them on separate layers, too. Text is represented as dot-matrix-like small horizontal lines—adequate for providing a guideline for reentry of text manually.

CAD/camera is slow. Even the manual states that converting an A-size drawing can take 15 minutes to an hour, while an E-size drawing requires "a few hours."

The program's ability to create solids is a double-edged sword. It lets the program represent objects that would be difficult or impossible to convert, but it also can lead to extra cleanup work. For example, in the magnified part of a converted drawing from Autodesk's sample disk, a rough edge in the original caused *CAD/camera* to create many small solid blobs that you would have to remove manually.

CAD/camera is unquestionably still the most sophisticated program of its kind, but you pay a price—in both the high cost of the software and its slow operating speed.

CADmate

Microtek Lab's *CADmate*, a new *CAD/camera* competitor, is priced at $995. It's not only one-third the cost of the high-priced spread, it's also at least three times faster.

CADmate works with Microtek Lab's own scanners as well as with the large-format Houston Instrument Model 128 and any other scanner that can produce raster files in Microtek Lab's or *CAD/camera*'s format. Like *ScanPro*, *CADmate* doesn't use display graphics, so any monitor is sufficient.

You give up some features for the savings and the speed. The program finds line segments only, ignoring solid areas, wide lines, circles and arcs, polylines, and other entity types. Its algorithms yield excellent line intersections, but the converted files have more line segments than those of both *CAD/camera* and *ScanPro*. As a result, you may have to do a little more manual touch-up work—or a lot more.

While *CADmate* is commendably fast, the quality of the vectorized image it produces is less commendable. To be fair, the version of *CADmate* we tested is new, and Microtek Lab promises performance enhancements in future releases.

ScanPro

American Small Business Computer's *ScanPro* is a straightforward raster-to-vector conversion program, available for $495 in versions for the Houston Instrument HiScan or the Hewlett-Packard ScanJet scanners. *ScanPro* can produce files in *ProDesign II*'s format or the standard .DXF format that *AutoCAD* and many other microcomputer CAD programs use.

Since *ScanPro*, like *CADmate*, doesn't display graphics, it works with any video display system. (*CAD/camera* can work in this "blinded" mode, too, but using it without the graphics previews is like throwing the baby out with the bath water.) The package includes an IGES translator, which further extends the product's compatibility with a wide variety of CAD software on both large and small systems.

ScanPro can discern circles and arcs, as well as line segments and solid areas. But it doesn't look for or recognize wide lines—a deliberate design decision by the developer.

You can control whether the circle/arc and solid searching is active. The tradeoff is speed; disabling one or both of these options results in faster execution.

Even with all flags flying, though, *ScanPro* is noticeably faster than *CAD/camera*. In general, *ScanPro* runs about three times faster than *CAD/camera*, varying slightly depending on the specific drawing. *ScanPro*'s files are also significantly smaller than those created by *CAD/camera*, partly because circles and arcs occupy much less storage space as single entities instead of as a large number of vectors.

—Glenn A. Hart

FACT FILE

CAD/camera
Autodesk Inc.
2320 Marinship Way
Sausalito, CA 94965
(415) 331-0356
List Price: $3,000
Requires: 512K RAM (640K RAM recommended), hard disk with 1 Mbyte free, 8087 or 80287 coprocessor, Hercules monochrome graphics or Quadram Quadscreen graphics adapter, DOS 2.0 or later, *AutoCAD* 2.18 or later.
In Short: The first raster-to-vector program on the market, this high-priced package, designed to work with *AutoCAD*, is more sophisticated than its competitors but also slower. Supports a limited number of scanners—only those from Datacopy. Not copy protected.

CIRCLE **645** ON READER SERVICE CARD

CADmate
Microtek Lab Inc.
16901 S. Western Ave.
Gardena, CA 90247
(213) 321-2121
List Price: $995
Requires: 640K RAM; hard disk drive; CGA, EGA, or Hercules monochrome or compatible grahics card; DOS 2.0 or later (DOS 3.0 or later on an AT).
In Short: Three times faster and one-third less expensive than the market leader, this raster-to-vector conversion program finds line segments only; sacrifices image quality for speed and low cost. Not copy protected.

CIRCLE **644** ON READER SERVICE CARD

ScanPro
American Small Business Computers
118 S. Mill St.
Pryor, OK 74361
(918) 825-4844
List Price: $495
Requires: 512K RAM, hard disk drive, DOS 2.0 or later.
In Short: Compatible with a wide variety of CAD software, this inexpensive raster-to-vector conversion program can discern circles and arcs, as well as line segments and solid areas, but not wide lines. Faster than the more-sophisticated *CAD/camera*. Not copy protected.

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PRINCETON GRAPHIC SYSTEMS

The Laser Scanner Model LS-300

Princeton Graphics Systems' The Laser Scanner Model LS-300 is based on Canon's IX-12 scanning engine, Z-Soft's PC Paintbrush Plus *and Essex Publishing's* PC-OCR *software. This 13- by 11½-inch unit connects to an included half-slot card through a 15-pin connector.*

Like AST's TurboScan, Princeton Graphic Systems' $1,095 The Laser Scanner Model LS-300 bundles the wares of other manufacturers—in this case, Canon's IX-12 scanning engine, Z-Soft's *PC Paintbrush Plus*, and Essex Publishing's *PC-OCR* software. Princeton Graphic supplies the label, a hardware instruction card, and good phone support.

The scan engine itself has a modest 13- by 11½-inch footprint. Hardware installation is easy and well documented. The designers, however, have assumed that you will keep the unit on top of your PC; the special 15-pin cable linking the scanner engine to the half-slot interface card is a few feet short. During a scan, paper travels in a straight line from the front feeder past the scanning area into a rear output tray. The feeding system usually kept pages aligned properly, and jams and misfeeds were easily cleared. Still, I had to feed a few line-art samples several times to avoid misalignment.

The scanning unit has no panel controls, because the software handles everything. *PC Paintbrush Plus* acts as both scanner interface and graphics editor—a scheme with both advantages and limitations. Chief among the latter is that you can't scale or modify an image before it becomes a bit map, since the scan engine outputs such a map directly into the paint interface. That's a drawback because making an image smaller can hide imperfections and take up less disk space. On the other hand, *PC Paintbrush Plus* does offer fat-bit editing, rotation, inversion, and the standard paint editing features. I can live without the scaling.

Line art scans quickly and with little fuss. You can designate a scan window, one of three brightness/contrast settings, and resolutions ranging from 72 to 300 dots per inch. The system lets you scan, preview, and edit the image before committing it to paper, which is useful if you happen to get a misalignment. The continuous-tone samples were also easy to scan. The LS-300 uses dithering, which approximates gray values as patterns of bit maps. The gray-scale image and photograph produced publishing-quality output on a laser printer or a high-quality dot matrix; even my primitive 9-pin model generated a good (if not publishable) image. The color sample, scanned using dithering, displayed most of the warm shades as lighter grays and the cool colors in darker grays. The value went to black only on dark blues, violets, and some of the gray-screened colors on the inner ring.

WEAK LINK The *PC-OCR* software is the weakest component of the LS-300 system. On the surface, this package seems quite powerful; it offers a learning mode for existing fonts and for building a new font-recognition library. In practice, however, *PC-OCR* performed erratically and required more operator intervention than did other software.

PC-OCR supports the common mono-

PC MAGAZINE FACT FILE

The Laser Scanner Model LS-300
Princeton Graphic Systems
601 Ewing St., Bldg. A
Princeton, NJ 08540
(800) 221-1490
(609) 683-1660

List Price: $1,095; PC-OCR software, $495.

Requires: 512K RAM, two disk drives (hard disk recommended).

Supports: AT&T 6300, AT&T DEB, ATI Graphics Solution, Hercules monochrome graphics adapter, IBM CGA, IBM EGA, PC*jr*, Micro Display Systems Genius VHR, Persyst BOB, Plantronics ColorPlus, Profit Multigraph II, Quadram Quadcolor, Sigma Color 400, STB Systems SuperRes, Tecmar Graphics Master, Tandy 1000, 1200, and 3000, Tseng Labs Monochrome and EVA 480, Wyse WY-700, Xerox 6065, Video 7 Deluxe; dot matrix, ink jet, and laser printers; Microsoft-compatible mice, AT&T 6300 keyboard mouse, MindSet Mouse, Hewlett-Packard Vectra Mouse, Key Tronic KB5153 Keyboard, GTCO DigiPad, Kurta IS/ONE Series Tablet, Kurta Pen Mouse, Summagraphics SummaSketch and compatibles, Hitachi Digitizing Tablet, Scriptel Digitizing Tablet, Honeywell microLYNX trackball.

In Short: A graphics/OCR scanner package consisting of Canon's IX-12 scanning engine, Z-Soft's *PC Paintbrush Plus*, and Essex Publishing's PC-OCR. On the whole, the system components are good but poorly tied together.

CIRCLE **621** ON READER SERVICE CARD

space typefaces and offers rudimentary text formatting for tabs and line endings. Page-margin size is limited to 8 by 10 inches, so you can't scan from edge to edge. Page setting, fonts, and format files are loaded through a cumbersome menu system that doesn't accept keyboard input: you press the Spacebar to step through the options and you can't back up if you make a mistake.

There are several scanning modes. The slowest, auto-font, requires no intervention but takes its time recognizing characters. I used the learning and correction modes most of the time; although they require intervention, they scan with the most accuracy. When it encounters an unknown character, *PC-OCR* displays an enlarged picture of it, along with its "best guess." You can edit that picture and store it either as a primary image for that character or as one of up to four secondary ones, with a limit of 22 secondary images per font. You can also override the best guess at the keyboard.

When scanning the samples, I noticed that *PC-OCR* had a hard time recognizing monospace Courier. The cover letter, typewritten on good paper, produced 10 errors out of 600 characters the first time and 17 errors the second. *PC-OCR* had a hard time with such distinctive shapes as Courier's *A*, *M*, and *Z*, and often cut off descenders, reading *g* as *o*. I used the correction and learning modes, but each scan of a page produced different results. The spreadsheet page, which I expected to be difficult, had only 2 mistakes, yet the outline sample had 12 errors on very common letters.

On the plus side, *PC-OCR* does not simply dump text with a bunch of flags into an ASCII file. User intervention gives you more control, which can be important when a misplaced comma or decimal costs money. Further, because it can "learn" to read-master font files created on the typewriters and printers you use every day, *PC-OCR* can adapt to your particular environment. If you don't mind the work up front, you'll probably get satisfying results.

Princeton Graphic's LS-300 is fairly typical of products bundling third-party hardware and software under a company logo: the parts that make up the whole are good but aren't properly unified. The *PC Paintbrush Plus* scanner interface is easy to use; the *PC-OCR* interface drove me nuts. The OCR learning mode was excellent but not well documented. I often wished that the company had hired a writer to tie the whole thing together. Princeton Graphic is certainly not the only manufacturer that acts this way, but The Laser Scanner Model LS-300 has so much promise that I hate to see it sold like a smorgasbord.—**Tom Stanton**

SHAPE INC.

ShapeScan SS-300

The ShapeScan SS-330, made by Shape and sold for $795, is a graphics-only scanner. The hardware is based on the EIT scanner reviewed last year ("Page-to-Disk Technology: Nine State-of-the-Art Scanners," *PC Magazine*, Volume 5 Number 16), which uses a unique optical system that has only one moving part. While this system offers excellent alignment, the trade-off is size: the scanner stands over 10 inches tall despite its modest footprint.

■ Princeton Graphic's Laser Scanner Model LS-300 scans line art quickly with little fuss.

The ShapeScan SS-330 offers two scanning modes. In the first mode, with 1 megabyte of Lotus/Intel/Microsoft Expanded Memory System (EMS), you can scan line art (no continuous tone) into *PC Paintbrush Plus* at 240 dots per inch (dpi). In the other mode—direct-to-disk scanning—you don't need EMS, but you scan blind outside *PC Paintbrush Plus*. In other words, you must scan and save the image before you can edit it.

Installing the scanner is easy and quick, taking just a few minutes. You can configure the half-slot card for I/O addresses, but unlike most cards, it uses the 300-to-370

The ShapeScan SS-300 employs a unique optical system for scanning. The SS-300 illuminates the originals on its curved bed and scans them with a mirror at a focal point on thebottom. As the mirror pivots, it reflects the image into a CCD mounted at the rear.

address range. The scanner box needs a good 1-foot clearance for opening and closing the doors on the top, and it should be within reach for easy operation.

You place your originals on a curved flatbed that accepts pages up to 8½ inches wide and 14 inches long. The shape of the bed makes it difficult to scan anything but single sheets.

UNIQUE OPTICAL SYSTEM The ShapeScan uses a unique optical system for scanning. It illuminates the originals on the curved bed and scans them with a mirror at a focal point on the bottom. The mirror pivots slowly and reflects the image into a CCD that is located at the back of the device. This system takes up space but produces excellent line art alignment, a big plus that makes up for the available 240-dpi resolution.

FACT FILE

ShapeScan SS-300
Shape Inc.
Electronic Instruments Division
301 U.S. Route 1
Scarborough, ME 04074
(800) 247-1724
List Price: $795
Requires: 512K RAM, hard disk drive.
Supports: AT&T 6300, AT&T DEB, ATI Graphics Solution, Hercules monochrome graphics adapter, IBM CGA, IBM EGA, PC*jr*, Micro Display Systems Genius VHR, Persyst BOB, Plantronics ColorPlus, Profit Multigraph II, Quadram Quadcolor, Sigma Color 400, STB Systems SuperRes, Tecmar Graphics Master, Tandy 1000, 1200, and 3000, Tseng Labs Monochrome and EVA 480, Wyse WY-700, Xerox 6065, Video 7 Deluxe; dot matrix, ink jet, and laser printers; Microsoft-compatible mice, AT&T 6300 keyboard mouse, MindSet Mouse, Hewlett-Packard Vectra Mouse, Key Tronic KB 5153 Keyboard, GTCO DigiPad, Kurta IS/ONE Series Tablet, Kurta Pen Mouse, Summagraphics SummaSketch and compatibles, Hitachi Digitizing Tablet, Scriptel Digitizing Tablet, Honeywell microLYNX trackball.
In Short: This low-cost graphics-only scanner is limited to scanning line art at 240-dpi resolution; it comes with *PC Paintbrush Plus*, and you can configure it for use with EMS, to scan into *PC Paintbrush Plus*, or for standalone editing.

CIRCLE **620** ON READER SERVICE CARD

The ShapeScan comes with *PC Paintbrush Plus*, and you can configure it either for use with EMS, to scan into *PC Paintbrush Plus* for editing, or for use without EMS, to do direct-to-disk scanning and then standalone editing. If you lack the necessary EMS, you can use the separate *Scan* program and check the images later, as we did for our tests. You first create a temporary file that you can view and then discard or convert to .PCX (*Paintbrush*) format, which takes several minutes. You must quit *Scan* and load *Paintbrush*, then load the image and look it over, and if you're dissatisfied, quit *Paintbrush* and repeat the procedure.

The *Scan* software lets you set normal or reverse image, resolution, image window, and filename. The brightness control is a mechanical slide switch located on the scanner.

In our tests, the ShapeScan took several minutes to scan and convert the images of the logos and the grid (the only images we used in the tests that it could scan). Overall, it took longer than other systems required to do these simple tasks.

The ShapeScan's use of the curved flatbed and mirror is bulky but clever, and in some applications it offers the best possible alignment. We would like the flatbed better if it didn't limit the width of the original.

Granted, at $795 the ShapeScan is a bargain used in the direct-to-disk mode. But we advise spending the additional $300 that mail-order houses want for 1 megabyte of EMS, if you don't already have it on hand, and using the scanner to scan into *PC Paintbrush Plus*. (You can use the EMS with other products, too.)

If line art is all you need to scan and you can make do with 240-dpi resolution (and, if you lack EMS, you don't mind blind scanning and the necessary conversion time), why buy a more expensive scanner? The ShapeScan SS-330 can do your bidding.—**Tom Stanton**

SPECTRAFAX CORP.

SpectraFAX 200

The allure of SpectraFAX's $3,995 scanner, the SpectraFAX 200, is color. It's one of two scanners on the market that can scan color photographs (the other is the $6,649 Howtek Scanmaster, also reviewed in this issue).

FACT FILE

SpectraFAX 200
SpectraFAX Corp.
2000 Palm St. South
Naples, FL 33962
(813) 775-2737
List Price: $3,995
Requires: 640K RAM, hard disk drive.
Supports: Hercules monochrome, IBM CGA, IBM EGA; dot matrix and ink jet printers; Microsoft-compatible mice.
In Short: This scanner is one of the few on the market that does color, but the cost of that capability is the fairly high price of the scanner. The machine is bulky but not heavy, and it's easy to install and use.

CIRCLE **619** ON READER SERVICE CARD

At its price, almost $4,000, the scanner had better be alluring. But if color scanning is essential for your business, the sturdy, easy-to-install-and-use SpectraFAX can do the job for you (although, as you'd expect, not with the same level of performance and outstanding output as the even-higher-priced Howtek scanner).

Measuring about 10 by 25 by 15¼ inches (HWD), the SpectraFAX is not the kind of machine you keep on your desk. It has a hinged top cover and glass bed, like a photocopy machine, and is as bulky as a small office or personal copier. In fact, it looks and operates much like a photocopy machine, except that it has no drum, toner, or direct output of paper.

EASY INSTALLATION The SpectraFAX is easy to install. The board is a half-card with only one jumper on it. (You have to reset the jumper only in the rare case of a conflict with another peripheral device, such as a nonstandard laser printer.) Basically, you simply connect the power cord and the connection cable, and the scanner is ready to go.

Software initiates the scanning. Although several vendors claim that their paint programs will run the scanner, SpectraFAX calls *PC Paintbrush* the only official operating system. In fact, SpectraFAX bundles a customized version of *PC Paint-*

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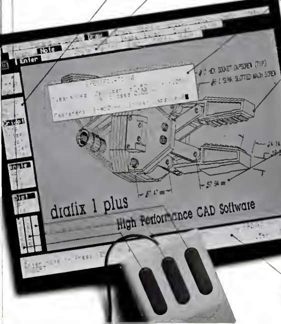

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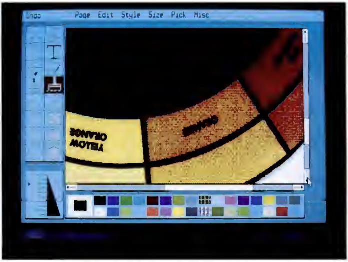
brush (developed by its vendor, ZSoft Corp., of Marietta, Georgia) with the scanner.

PC Paintbrush is also easy to install. It includes a straightforward install program for specifying the equipment you're using.

From a hardware point of view, copying material, from small photographs to color illustrations in a book, is a cinch. The SpectraFAX can cope with images that are up to 8½ inches by 14 inches. Even a 2-inch-thick original will fit under the cover.

The SpectraFAX 200 is a hefty unit measuring 10 by 25 by 15½ inches (HWD) that can scan full-color images as large as 8½ by 14 inches. Indicator lights on the right of the scanner tell you when each of the scanning phases is active.



The SpectraFAX 200 records 16 true colors. A scan of the color wheel above showed that dark shades are hard to replicate. Adjusting the values for color and intensity improved results.

An indicator panel is located on the front right-hand side of the machine. Little red lights tell you when the power is on and when each scanning phase is in process.

Beginning a scan is simple. You simply position the image on the glass bed and bring the cover down on top of it. Then you pull down the Page menu on the main *PC Paintbrush* screen and choose the Scan option. You're presented with a simple form that lets you set parameters for the scan: the size of the image, whether it's line and text or a photo, whether it should be printed as it appears or in reverse black and white, and the values for the degree of red, green, and blue, as well as the intensity. When you click the mouse pointer on the OK box, the SpectraFAX begins to scan.

While the scanner is operating, you periodically hear a low rumbling noise as the engine's stepper motor goes into action. And at the start of each scan, you hear another sound, like a strangled buzzer, as the filter wheel spins into place.

The SpectraFAX scans the image four times, once for each of the three primary colors, and then once for the intensity. If the image it's scanning is black and white, the scanner makes only one pass, for the intensity.

The images that the SpectraFAX returns to the *Paintbrush* screen are about three times the size of the original because, while the typical photo has 600 dots per inch (dpi), the software can handle only 200 dpi. Also, the images are elongated because the typical monitor's screen is wider than it is long. So you have to scroll around on the screen to find the part of the image you want to work with.

Naturally, when you print images, the SpectraFAX will produce output in its original size and without the shape distortion. You can also print any size you want—from 1 inch by 1 inch to 2 feet by 300 feet (the range the *PC Paintbrush* printer driver can accommodate).

COLORS The colors you get in the image may not be exactly the same as in the original. With the present state of technology, the scanner is capable of recording only 16 true colors and then dithering another 16. The dark shades are particularly difficult to replicate.

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CIRCLE 516 ON READER SERVICE CARD

The best approach for getting better color is to play with the value numbers for the colors and the intensity. The value numbers range from 0 to 240, but the most useful range is really between 50 and 100. Below 50 and above 100, you get too little or too much color—either washing the image out or over-darkening it.

The default setting for all the colors and the intensity is 65. But if you're working with a light black-and-white image, it's better to raise the intensity. With a light-colored picture, you'd want to lower the intensity below the values for the colors.

One other trick: you can recalibrate the scanner. When you first set up the SpectraFAX, the manual tells you to calibrate it—to set the color value to the most efficient range. To do so, you run a utility file in the software program. The manual instructs you to enter a calibration contrast value of 128.

The manual also advises you to recalibrate the scanner occasionally, but it doesn't tell you how often. According to the manufacturer, you should recalibrate within several days so that the machine can adjust to warmed-up working conditions. You should repeat the process if the scanner has been idle for any length of time.

Once you have an image stored in memory, you can edit it with all the painting tools *PC Paintbrush* makes available: brush, roller, spray can, scissors, eraser, circle, boxes, and so on. Of course, you can also zoom in on sections of the image to do fine editing. You can crop the picture—but only the part visible in the *Paintbrush* window. You can also change the colors and use fill patterns.

A 6- by 8-inch color original will result in a 300K-byte file on your hard disk. Yes, a hard disk is required to do color scanning.

Clearly, despite its ease of use, the SpectraFAX is a machine for those who truly need color scanning and who can afford it but not the $6,649 Howtek Scanmaster. The SpectraFAX has been on the market for about 2 years, and the vendor says it has sold fewer than 200 machines.

The software is also 2 years old. Although ZSoft has improved *PC Paintbrush* considerably, it hasn't carried those improvements over to the SpectraFAX version because the market is so small.

Eventually, both the scanner and the software will be upgraded as the market for color scanning grows. Perhaps the price will also change as the market develops. For now, scanning color photographs into your computer, and then editing them, is both easy and exciting—not to mention pretty expensive—with the SpectraFAX 200.—**Henry Fersko-Weiss**

TAXAN CORP.

Crystal Scan Image Scanner Model 300I

The Crystal Scan Image Scanner Model 300I, made by Taxan Corp. and selling for $1,695, offers flexibility and good performance in both graphics scanning and optical character recognition (OCR). With its *Windows*-based image-editing software, *EyeStar Plus*, it handles graphics scanning. The optional $595 *ReadRight* software enables it to handle OCR tasks.

Like several other scanner vendors, Taxan has based its scanner on the Microtek scanner engine. To connect the sheet-fed scanner to your computer, use either an RS-232C/RS-422 asynchronous or a high-speed synchronous interface. The serial interface makes the unit compatible with non-PC-compatible computers such as the Apple Macintosh. We used the high-speed IBM interface, which resides on a half-length card. You set the I/O address by using the eight-position DIP switch.

The Crystal Scan Image Scanner feeds one sheet at a time through its roller system; an optional sheet feeder is available. The scanner itself has no controls; the software controls all operations. Only Power and Ready LED indicators inform you of the scanner's status.

The scanner's manual includes detailed command set instructions that might help a programmer interface directly to the scanner. Otherwise, it's overtechnical and hard to use. For our tests, we used the *EyeStar Plus* graphics scanning software and the *ReadRight* OCR software.

EyeStar Plus operates under *Microsoft Windows*, so you must have the *Windows* package installed in your system. The fact that Taxan supplies no run-time version of *Windows* may not be a problem for many graphics-oriented users, but those who don't already have *Windows* must remember to include the cost of the Microsoft software in their price calculations.

EyeStar Plus puts the multiwindow capabilities of the *Windows* system to powerful use. It normally displays two helpful windows, one showing a full-page representation of your image at reduced resolution and the other a part of the image at full resolution.

FLEXIBLE SYSTEM An extremely flexible system, *EyeStar Plus* also offers comprehensive scanner control and a full spectrum of painting and enhancement tools. Even file loading, for example, incorporates many options. If you attempt to load an image that's too large to fit a selection area you've defined, you can clip, abort, or ignore the selection area. You can also decide what to do with the existing image, choosing to replace it entirely, keep all black stable, have white appear wherever either the current or loaded image contains white, or combine both images so that white appears wherever both images originally contained black.

These choices are functionally XOR, OR, and AND commands, which could be useful for advanced graphics applications. Also, you can reduce, enlarge, stretch, or squeeze the incoming image two to nine times its size. And when you save, the software can compress your image so that it will occupy less disk space (although

PC MAGAZINE FACT FILE

Crystal Scan Image Scanner Model 300I
Taxan Corp.
18005 Cortney Ct.
City of Industry, CA 91748
(818) 810-1291

List Price: $1,695; *ReadRight*, $595.

Requires: 512K RAM, two disk drives, *Microsoft Windows* (for graphics if using the *EyeStar Plus* software).

Supports: All graphics cards, printers, mice, and pointing devices supported by *Microsoft Windows*.

In Short: Works well as both an OCR and a graphics scanning device. But the software is relatively complex.

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only line art fares well with compression).

EyeStar Plus can save images in *PC Paintbrush*, TIFF, and *Windows Paint* formats, in addition to its own format (it also automatically recognizes these formats and can load them, too). This excellent flexibility enables you to use the Crystal Scan Image Scanner with a variety of other software, including desktop publishing programs.

Printing is equally flexible. You can print part or all of an image, decide which parts of an image to print if it exceeds the paper size, enlarge it by up to nine times, and make multiple copies.

EyeStar Plus gives you a standard assortment of drawing tools, which are more than adequate for modifying scanned images. Bearing a striking resemblance to the tools in *Windows Paint*, the tools include the common drawing, pattern fill, high-magnification bit editing, and text facilities.

The software also enables you to adjust contrast, brightness, halftone grain, reduction, and so forth. You can even specify up to four windows, which the Crystal Scan Image Scanner can scan using different parameters.

The test logo sheet, which is of relatively thick stock, gave the Crystal Scan Image Scanner some trouble. The scanner repeatedly refused to grab the sheet cleanly, usually putting a reasonably severe skew on the sheet as it drew it through the scanning mechanism. The sheet took on a decided reverse curl, too. What's worse, the scanner didn't release the sheet cleanly, so the bottom of the image was distorted.

The Crystal Scan Image Scanner passed the other graphics scanning tests smoothly, but we had to cut the edges of our circular color wheel to get it to pass through the scanner's roller system. Although the Crystal Scan Image Scanner's input area is slightly narrower than those of some other scanners, it can handle normal-sized pages with no problem.

Under the control of the *EyeStar Plus/Windows* combination, scanning with the Crystal Scan Image Scanner is definitely on the slow side, even on our test AT. In addition to the overhead imposed by *Windows*, a large amount of writing to and from disk is necessary to store the large files common to bit-mapped graphics. Yet this approach is more convenient and less costly than that of programs requiring huge amounts of RAM to store working images.

■ The Crystal Scan Image Scanner Model 300I works well, especially as an OCR device.

OCR SOFTWARE The scanner's optional OCR software, *ReadRight*, installs easily. You simply tell the software the address of the scanner and the type of video you're using.

ReadRight's easy-to-understand interface takes full advantage of the PC's function keys. You can select a section of the source page by inputting the various margins to delimit your desired area. *ReadRight* gives you complete control over print intensity, contrast, brightness, paper length, and output format. And you can choose whether to see the output on your screen and whether to put each page in a separate file or a series of pages combined into one file. *ReadRight* generates files in standard ASCII format or in *WordStar* or *WordPerfect* format.

A nifty memory-resident utility called FORAD (for FORmat ADapter) can convert text files into *WordStar*, *WordStar 2000*, *Symphony*, *PFS:Write*, *MultiMate*, *DisplayWrite*, *PC-Write*, *Canonwriter*, and *Microsoft Word* formats. It can insert soft returns at the end of each line and retain the page breaks from your OCR scan.

Our tests of *ReadRight* disclosed generally satisfactory performance. We tested the dot matrix samples first, with less-than-marvelous results, as expected. The scanner read only the bold characters on the 9-pin dot matrix output even approximately correctly; the remaining characters turned out as gibberish, no matter how we juggled the software controls. It handled 24-pin draft output somewhat better, but the output was not usable. The scan of 24-pin near-letter quality was borderline, with

Taxan's Crystal Scan Image Scanner Model 300I is a sheet-fed scanner based on the Microtek engine. Though it has no panel controls, Power and Ready LED indicators keep you informed of the scanner's status. The 300I connects to the PC through either an RS-232 or RS-422 connector.

just few enough errors to make the process worth the effort.

The output from the scanning of Times Roman proportional was legible, surprisingly, since *ReadRight* doesn't claim to handle such print, but the error rate was high. The scanner read monospace Courier and Prestige Elite type more or less perfectly. While boldface didn't faze the scanner at all, underlining caused consistent errors on the characters with descenders but was otherwise fine.

The scanner and *ReadRight* did rather well on the six-page test letter. The error rate on the Courier type was acceptably low for the most part. Editing the converted text was no problem.

ReadRight occasionally inserts an extra space into the scanned text—a potentially troublesome flaw when working with spreadsheets. Although *ReadRight* doesn't have any special facilities to export to a spreadsheet, we were able to import the numbers into *1-2-3*, but the numbers imbedded into the part numbers and the extra spaces meant we had to do a lot of editing to yield even the numeric portion. But perhaps the trouble would have been worth it for scanning a much larger sheet.

ReadRight scanned our multicolumn sample well, retaining the two-column layout. We had no trouble defining two scan areas and reading each column into a separate file for editing.

Overall, the Crystal Scan Image Scanner works well, especially as an OCR device. Its graphics-scanning performance is good, too, but the problems the narrow feed slot caused when we tried to feed the thick logo sheet, combined with the relative complexity of *EyeStar Plus*, detract somewhat from its advantages.

—Glenn A. Hart

TOTEC CO. LTD.

Pro-Scan Model 5050

The Pro-Scan Model 5050 from Totec Co. is one of the simplest and the heaviest OCRs I've seen. It requires no special hardware or software. Installation is as simple as plugging in the power cord and a serial cable. But it is only an OCR and will not scan graphic images.

■ The Totec Pro-Scan 5050's control panel is attractive and relatively easy to use.

To the computer, the Pro-Scan 5050 looks like nothing more than a normal serial input device. The unit must be connected to one of the host computer's COM ports through a standard 25-pin serial cable (which is not provided). Scanning is controlled from its front panel. As the 5154 reads in pages, it sends data to the host computer's serial port. The user must provide his own communications program to capture this character stream into a disk file for later editing. No special hardware or software is required.

Physically, the Totec 5050 looks and acts like a photocopier. Once the communications program is started, stack the pages to be scanned in the input hopper, press RUN, and collect the pages from the output hopper. The 5050 has markings for standard letter size, legal size, and A4 and A5 formats. The control panel is attractive and relatively easy to use. One LCD row informs you of input options, as well as problems that may arise.

INDUSTRIAL STRENGTH Everything about the 5050 is industrial strength. The hopper has a sturdy, well-made feel. The front panel is membrane covered to resist dirt and spills. All of the parts are of heavy-gauge metal. At 78 pounds, the 5050 is far and away the heaviest of the scanners tested, requiring two people to safely pick it up. The 5050 seems designed to be placed in the office, connected to a particular machine, and left there to do its job.

The 5050 was set up to output straight ASCII files. When purchased, however, you may indicate any word processor format desired. Totec customizes the 5050 in the plant to that word processor before shipping by replacing an internal ROM (read-only memory). Totec already knows about the common formats and requires sample files for some of the more exotic word processors. Changing word proces-

Weighing in at 78 pounds, the Totec Pro-Scan Model 5050 is one of the heaviest optical character readers on the market, and with good reason. All of the unit's parts are made of heavy-gauge metal, and the front panel is membrane-covered to resist dirt and spills.

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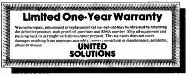

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sors requires the ROM to be changed.

The Totec did a good job reading the sample text. It accurately scanned over noncharacters, such as signatures, generating a minimum of garbage characters. Letters and tables were reproduced almost without error. It did get confused on the proportional fonts, as well as the dot matrix input, eventually just giving up with a message before continuing with the next page. Oddly, one of the most common errors the Totec made was confusing an uppercase *Y* with one of the IBM graphics symbols. Considering how infrequently the IBM graphics symbols appear in print, this seemed odd to me. The user may select any of 20 fonts via the front panel; however, selecting the all-purpose MULTI seemed to generate about as good a result as any.

All of this adds up to a machine intended squarely for heavy office use. The Totec may not have all of the bells and whistles of some of the other scanners, but to an office more interested in scanning letters than playing with scanner options, it's just the ticket.—**Stephen Randy Davis**

FACT FILE

Pro-Scan Model 5050
Totec Co. Ltd.
9205 Alabama Ave., Suite B
Chatsworth, CA 91311
(818) 718-0055

List Price: $8,990, with 12 fonts; Model 5152, with 5 fonts, $7,990; Model 5155, with 20 fonts, $9,990; optional fonts, $295; additional ports for different interface, $495; MACS communications program for *MultiMate*, $145; ECOM communications program for *Enable*, $145; MWACS communications program for *Microsoft Word*, $145; PWACS communications program for *PFS* series, $95; OWACS communications program for *OfficeWriter*, $95; CACS communications program for *CPT/Personal Typewriter Word Processing*, $95.

Requires: When used with software that uses the expanded ASCII character set, the scanner requires one of the special communications packages manufactured by Totec, listed above.

In Short: Intended for heavy-duty office use, this unit is sturdy and easy to use.

CIRCLE **617** ON READER SERVICE CARD

Printhead Attached Scanners

COMPUTER AIDED TECHNOLOGY INC.

CAT Image Scanner

If you have just about any Epson-compatible dot matrix printer, you can probably use the CAT Image Scanner from Computer Aided Technology. Priced about the same as its competition, it offers some unique solutions to the problems of printhead scanning. Despite its inventive design, however, this system is a bit too troublesome to warrant a good recommendation.

The most obvious difference between the CAT Image Scanner and the others is that it requires no serial port. That probably seems incredible—after all, the Centronics parallel port lets data flow only from the computer to the printer, right? Well, yes and no.

Although the parallel-port design only allows "data" to flow from the computer to the printer, it does permit the printer to talk back to the computer—for example, to alert the computer that it is off-line, or out of paper, or that its buffer is full. The CAT Image Scanner plays all sorts of tricks with these extra communication lines in the parallel connection, using them to transmit the information from the scanner back to the printer.

The advantage of all this is that you don't need an extra serial port for your scanner. The disadvantage is that not all computers implement the parallel port thoroughly. Although I had no problems with an IBM PC-XT or PC AT, my Leading Edge refused to work properly with the CAT Image Scanner.

The scanner itself, a small optical sensor, is mounted on the printhead and then plugs into a control box that's about the size of a pack of cigarettes. This box has a power switch, a sliding contrast adjustment, and a row of six green LEDs for adjusting the scanner. The printer's parallel cable plugs into the box, and a 25-pin ribbon cable provided with the kit connects the box to the computer.

Mounting the sensor is not as simple as attaching the cables. The first major challenge is correct placement of the mounting bracket that holds the scanner in place. You can attach the bracket to the side of the printhead using either double-sided foam tape or quick-setting glue (both included). Try the tape first; it's much more forgiving than the glue, and the alignment of the bracket is critical. Once you've learned how to mount the bracket in the right spot, you can take off the tape and glue the bracket down more permanently. (Be forewarned: since the tape isolated the scanner from the printer chassis's electrical ground, I got a mild shock when mounting the scanner on a Citizen printer. To avoid the problem, never grasp both the printhead and the scanner at once.)

FUN WITH LEDs After placing the mounting bracket, you slip the scanner tube into the bracket. Now the fun really begins. You have to angle the tube so that its light hits the paper's surface just a bit higher than perpendicular—a tricky proposition with paper wrapped around a curved platen. Then you move the scanner head in and out of the white paper surface until you get all six LEDs on the box to light up. Now slide the printhead so that the scanner is over a solid black area and move the head in and out until only one

FACT FILE

CAT Image Scanner
Computer Aided Technology Inc.
7411 Hines Pl., #212
Dallas, TX 75235
(214) 631-6688

List Price: $295; $355 with *PC Paintbrush*.

Requires: 640K RAM, two disk drives (hard disk recommended), parallel port.

Supports: Epson 9-pin, LQ 24-pin, graphics, or compatible printers.

In Short: Difficult to install and adjust, the CAT Image Scanner works, but its temperamental software only adds to its problems. It can create *PC Paintbrush* files, which is a plus, but it does not represent as good a value as some of the competition.

CIRCLE **616** ON READER SERVICE CARD

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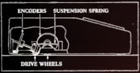

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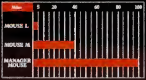

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CIRCLE 131 ON READER SERVICE CARD

The CAT Image Scanner is an optical sensor that you can mount on the printhead of most any Epson-compatible dot matrix printer. The sensor plugs into a control box that attaches to the PC through a supplied 25-pin ribbon cable and to the printer via its parallel port.

LED is lit, and repeat the process until white gives you six LEDs and black gives you one without any adjustment. Finally, slide the printhead all the way to the right-hand side of the page and repeat the process, to make certain that the settings work over there as well. Be prepared for a time-consuming, frustrating task.

Once you've done this work, you should never have to make more than minor adjustments. (Foam tape tends to let the adjustments wander, so glue makes a better permanent arrangement.) When you're finished scanning, turn off the box, lift the scanning tube from the mounting bracket, and put the printer ribbon back. There are no cables to disconnect, and when the box's power switch is off, your printer performs normally.

The CAT Image Scanner has a unique answer for the timing problems that are currently associated with printhead scanners: two vertical black timing bands that bracket the image to be scanned. By using the bands on each side of the image as reference points, the scanner can calculate the distribution of the sampled dots registered on the scan line. The timing bands come as preprinted, cut pages that look like mats for picture frames. First select a mat with an opening large enough to accept your image (none could accommodate the entire color wheel). Then place the mat on top of the original, load both into a light-blue acetate carrier, and crank the combination into your printer's platen, lining it up so the optical sensor starts to the left of the first timing line.

That stack of pages makes for a relatively thick package, which in itself can cause problems. When I tested the CAT Image Scanner on a Citizen MSP-10, the printhead moved an inch or two and then halted with a sickening grind. I worried that the stepping motor had gone south and had dismantled the entire printhead movement assembly before I realized the problem: the stack of pages was so thick that the printhead was jamming against the carrier. I adjusted the platen's page-thickness lever and was back in business. At the same time, I discovered that you can use that lever to fine-tune the distance between the scanner tube and the platen.

When I finally had solved my hardware problems, I found that the software had a few of its own. The software was faulty. It accepted meaningless responses to questions on scanning parameters. It reported that it was having trouble with the scanner adjustment—but only twice; then it merrily continued to scan as if all were well, until it suddenly gave an overflow error and dumped me back to DOS. It occasionally took this unexpected route to completion in other situations, too, but with no real consistency.

The software lets you scan an image at a vertical resolution of 54, 72, 144, or 216 dots per inch and over a variable range of horizontal resolutions from 50 to 300 dpi. Scanning at high horizontal resolutions sometimes left me with a image whose right half was compressed. Other scanning options include halftone or line art, width of the carrier in use, and display, offering CGA, EGA, and Hercules modes. (To use the Hercules option you must run a different version of the scan program from the start.) Once the scanning begins, the image is displayed on-screen, line by line. A press of the F key puts you in "fast mode" (still pretty slow by most standards), in which the lines are not displayed on-screen. The S key returns you to "slow mode," bringing back the display; the Q key stops the scan and offers the choice of storing the image or abandoning it. If stored, it goes into a bit-image file.

■ The CAT Image Scanner has a unique answer for the timing problems that are currently associated with printhead scanners.

The bit-image format can be converted to *PC Paintbrush* files, and halftone images have the additional option of being saved for laser printing. The CAT Image Scanner software can also print the images

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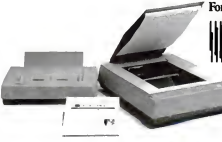

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CIRCLE 146 ON READER SERVICE CARD

directly, but only using an Epson-compatible printer. Since *PC Paintbrush* is flexible and supports a wide range of printers, Computer Aided Technology makes it available as part of a bundled package with the CAT Image Scanner.

The CAT Image Scanner works, but only after significant effort. Its hardware is touchy, its software unfriendly and far from bulletproof. Although it exhibits some fascinating design ideas, that's not enough to recommend this temperamental product. If you have an Epson-compatible printer, need *PC Paintbrush* files, are patient and forgiving, and work on a small budget, then the CAT Image Scanner may suit you. Otherwise, its limitations exceed its benefits.—**Alfred Poor**

The Epson Image Scanner Option Kit has a ROM cartridge, a scanner unit, a manual, software, and tools. The scanner unit fits onto the ribbon cartridge of Epson's LQ-2500 (shown here), EX-800, and EX-1000 printers. The scanner and printer connect to the PC through the serial port.

EPSON AMERICA INC.

Epson Image Scanner Option Kit

OK, time for a little word-association test: I say "dot matrix printer"; you say . . . ? Epson, of course. This company was hammering out dots on continuous-form paper long before the PC was on the drawing board. Its products enjoy a solid reputation and unmatched software support. So you probably expect Epson America's $299.95 printhead scanner attachment to be well designed and a cinch to run. And you probably won't be disappointed.

FACT FILE

Epson Image Scanner Option Kit
Epson America Inc.
2780 Lomita Blvd.
Torrance, CA 90505
(213) 539-9140

List Price: $299.95

Requires: 384K RAM; 512K RAM required for resolution above 640 by 200 pixels in graphics mode; one disk drive (hard disk recommended), serial port.

Supports: Hercules monochrome graphics adapter, IBM CGA, IBM EGA; Epson EX-800, EX-1000, or LQ-2500 printers.

In Short: Though printhead scanners are inexpensive and often flexible, the Image Scanner is unique for its ease of installation and powerful software If its 180-dpi resolution is sufficient, and if you have one of the three supported printers, this looks like the best way to go.

CIRCLE **615** ON READER SERVICE CARD

The biggest limitation of the Epson Image Scanner Option Kit, in fact, is that it fits only three printers—all from Epson. The version we tested works with the top-of-the-line LQ-2500; another is designed for either the EX-800 or the EX-1000. (The two kits differ only in their ROM cartridges.) That leaves the millions of users with other printers, even other Epsons, out in the cold.

The kit consists of the appropriate ROM cartridge, the scanner unit, a manual and software, and some installation tools. The scanner comes in a single-piece, black plastic housing designed to fit into the ribbon carriage, which is behind the printhead on these three printers. Before you can install the scanner, however, you have to make some minor modifications to the base of the ribbon carriage. Using tools supplied with the kit, you remove a base plate, insert a new mounting stage, and install a new, smaller base plate. The entire process takes only a few minutes, and when it's complete you can quickly exchange the scanning unit and the ribbon cartridge simply by snapping one out and dropping in the other. The scanner is firmly locked in place, so you won't need to perform any careful alignment procedures. You pay a high price for this convenience, however: Epson recommends that the new base not be removed once installed. After it's in, you can't use the color ribbon option on your printer, because the ribbon cartridge won't fit.

Although the three printers support either parallel or serial connections, you must use a serial connection with the Image Scanner. One small benefit is that you need only one cable between printer and computer, even when scanning. The LQ-2500 uses a unique cable, with a DIN connector on the printer end that you'll probably have to get from Epson.

BLANK WORK SPACE As on many paint programs, the screen for the Epson scanning software has a bar for pull-down commands across the top of a blank work space. Configuration is straightforward: you set the screen mode and the I/O ports right from the pull-down menus. The program can be run from the keyboard, but a mouse makes it far easier to use. Certain command keys, too, can make some procedures far faster and more efficient by letting you skip the menus.

On the blank work space, you can load images from bit-map files or scan them directly from the Image Scanner. The reason you'll find the mouse and the command

> ■ Epson's scanner provides an on-screen control panel that gives you power over settings for contrast, darkness, and other parameters.

keys useful, however, is that the scanning software does much more than simply scan in images; it gives you an abundance of editing options as well. To start with, it has limited paint-program features: a "pencil" command lets you draw straight or freehand lines, and there's an "eraser" option you can use to wipe out portions of the image. There's also a little "hand" icon for marking rectangular portions of the image with a flashing, broken-line box. Once you've marked the area, you can transform it in all sorts of ways—inverting, cutting-and-pasting, filling with black, and more. You can zoom in on a section of the image and perform single-bit editing, similar to a paint program's fat-bit option. The scan program can capture an image bigger than the screen and lets you scroll around to different portions of that image.

An on-screen control panel gives you power over settings for contrast, darkness, and other parameters, which you can change using buttons on the mouse. After changing the settings, you can redisplay the image using the new values. This powerful feature allows you quick and flexible control over the on-screen display. Moreover, only the screen representation is altered; you can play with different settings, without changing the underlying data, until you get the effect you want. A daytime photo can be modified to look like it was taken at night, and you can emphasize hidden details in pictures, much as NASA enhances satellite photos.

Images can be stored in their bit-image format or in files that can be used with *Windows Paint*, with BASIC programs, or with *Inset*, a memory-resident package from American Programmer's Guild that comes bundled with the scanner kit. *Inset* provides an elegant way to "drop" images into documents in other programs, including word processing and database packages that have no graphics capabilities of their own. It also permits further editing of the image, including scaling, rotation, and the addition of graphics elements. And *Inset* makes it easy to get a hard copy of your images, supporting a wide range of printers, including the HP Laserjet.

I had one minor compatibility problem with the Image Scanner. When I first tried it, all of its features appeared to run flawlessly on my XT system until I went to scan an image, at which point the system would hang. By selectively dismantling my AUTOEXEC.BAT and CONFIG.SYS files, I determined that my Bernoulli Box drive was the offending party. Other than that, I had no difficulties; the system ran under EGA, CGA, and Hercules modes on an XT, an 8-MHz AT, and a Leading Edge. By limiting the printers supported by the program, Epson evidently has eliminated the timing problems encountered with other printhead scanners.

Overall, the image quality produced by Epson's scanner was as good as you can expect with this technology. Add to that low cost, ease of installation, and simple but powerful operation, and you have a clear winner. The only question is whether or not you have the right printer—the economics change considerably if buying the Image Scanner means that you have to buy a new Epson printer as well.

—Alfred Poor

HOUSTON INSTRUMENT

Scan-CAD Accessory

The Houston Instrument Scan-CAD Accessory does only one thing: read line art from large originals and store it on disk. It does that one thing very well—and considering the price, it certainly should. Strictly an upscale product, at $2,995, the Scan-CAD lists for ten times the price of any other printhead product reviewed here, and it runs only on large plotters costing thousands of dollars. Just reading line art from big pieces of paper may not seem like much, but for an architectural or engineering firm that deals with large technical drawings, re-creating those drawings can get expensive. In that environment. the Scan-CAD could be a bargain.

PC MAGAZINE **FACT FILE**

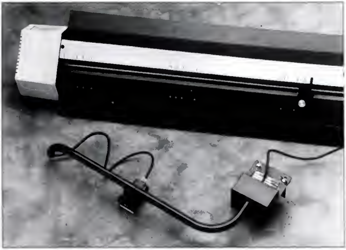
Scan-CAD Accessory
Houston Instrument, a Division of
Ametek Inc.
8500 Cameron Rd.
Austin, TX 78753
(512) 835-0900
List Price: $2,995
Requires: 640K RAM, hard disk drive, serial port (for plotter).
Supports: Houston Instrument DMP-50 series plotter; Hercules monochrome graphics adapter, IBM CGA, IBM EGA.
In Short: The Scan-CAD Accessory system is a boon to people who need to get draftings into their CAD systems and can afford the price of both the scanner and the plotter on which to run it. It falls short of excellent owing to a lack of follow-through on relatively minor details.

CIRCLE **614** ON READER SERVICE CARD

Houston Instrument has earned a reputation for building solid, well-designed plotters; its DMP-51 and DMP-56 models were selected as Editor's Choices in previous *PC Magazine* reviews. The Scan-CAD works on these plotters and on all other models in the DMP-50 series. The scanning unit itself is smaller than a typical TV remote control. In addition to the scanner, you get a long, curved metal tube that serves as a gantry for the connecting cable. That cable connects the scanner with a PC interface card that controls and reads the data from the scanner. The plotter-head motion is controlled through the same serial port used by the plotter itself.

Physical installation is smooth and straightforward. The metal boom clamps onto the side of plotter housing, and the connecting cable has modular plugs that make hooking up the pieces easy. The scanning unit slips into the same spot on the plotting head where the drafting pen usually goes, and there's even a place to park it up on the boom to keep it safely out of the way when it is not in use.

The hard part comes when you must determine whether or not you'll encounter conflicts when using the expansion board. Houston Instrument demonstrates here



Designed for Houston Instrument's DMP series plotters, the Scan-CAD Accessory is a scanning unit smaller than a television remote control. Included is a metal tube that serves as a gantry for the connecting cable to the PC interface card.

that while it designs some excellent products, it also comes up a bit short on occasion. For example, the Houston Instrument engineers gave their interface card the addresses reserved for prototyping boards. They also didn't give the user any way to change the board's configuration; the documentation suggests that conflicts be solved by either reconfiguring or completely removing the other board. These are not always practical options.

Another close-but-not-quite feature was a method provided to determine whether or not you'll have a conflict with existing cards. The documentation includes two short listings for BASIC programs: BEFORE.BAS, to be run before you insert the card to determine whether you're likely to have a conflict, and AFTER.BAS, to be run after inserting the card to tell you if a conflict might exist. My first beef is that these are tiny programs; why make the user enter them at all when they could easily have been added to the distribution disk?

More important, however: although BEFORE gave my system a green light for the card installation, AFTER said that I had problems. With my deadline approaching fast, I gambled and forged ahead, attempting to run the software in spite of the conflict message. It worked just fine. Whether the error occurred in the original program listing or in my typing of it I really don't know; the point here is that utilities like this can be useful only when they're accurate.

The software itself is a dream to use, requiring very little reference to the manual. The first step is to set a variety of parameters, the most important of which are the scan rate, which governs how fast the head moves across the document, and the return rate, which determines how fast it moves back. The speed of the data flow is tied to the scan rate, so the highest practical pace is limited by the computer's ability to accept the information. For a PC or XT, the recommended scan rate is 2 inches per second; ATs can handle rates up to the unit's top speed of 8 inches per second. The return rate is less critical and can be set to the maximum 8 inches per second unless the original is thin or fragile and needs a slower handling speed.

PREVIEW The next step, calibration of the scanner, is unusually simple: using the computer's cursor control keys, you position the scanner over a portion of the original that is to be read as "white" and you're all set. At this point, you can preview a portion of the scan, provided that you have a supported graphics display (which includes all of the standards). The preview scans about a 2-inch-square section of the document and shows it on the screen. To test the unit, I tried scanning portions of road maps (since they were at least as large as the plotter's page-size capacity), and I was fascinated to see how quickly and accurately the image, right down to the small type, appeared on-screen.

Once the scanner is calibrated and you have, if desired, previewed the image, you can start the actual scan. To indicate what portion of the document is to be scanned, you place the scanner at the upper-right-hand and lower-left-hand corners of the target region or at the four points that determine the limits of the drawing. Alternatively, you can define the entire area of the drawing, or a portion of it measured in inches, as the default drawing size.

The Scan itself proceeds rapidly, producing a 200-dot-per-inch raster image. This bit-map file can be quite large; no effort is made to show you all or even part of the results on-screen. The small preview is the best you will get. Unfortunately, the only option with the bit-image file at present is to convert it into a form that makes the image available to *AutoCAD* for editing and printing or plotting.

- The Houston Instrument Scan-CAD Accessory is a beautiful piece of equipment that does an outstanding job for the limited drafting and engineering market.

The Scan-CAD Accessory is a beautiful piece of equipment that does an outstanding job for a limited market. It is too expensive and specialized to be useful for

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CIRCLE 329 ON READER SERVICE CARD

desktop publishing, but if you need to read in engineering drawings or other samples from the drafting trade, the Scan-CAD could be an attractive time-saver.
—Alfred Poor

MICRO TECHNOLOGIES

PixiScanner

The low-priced ($269) PixiScanner, from Micro Technologies, has a terminally cute name and attractive documentation, fits a dozen different printers, and puts out good results for the money. Unfortunately, the road to success is long and difficult; you probably won't be able to travel it alone.

The physical installation itself is no problem and should take only a few minutes. First you mount a small processing unit on the front of your printer using Velcro strips. This box has a serial cable with a 25-pin connector for your computer and a telephone-type cable that goes to the optical sensor, encased in a cylindrical, black plastic housing. To attach that cylinder to your dot matrix printhead, you clamp one of several mounting stages to the printhead, attach a white plastic ring off to one side of the mount, and slip in the optical device. Be sure your printer is connected to your computer (probably through a parallel interface) and you're ready to go.

Loading the software, too, is fairly simple: you just transfer all the files to a convenient subdirectory and type PS to fire it up. An Enrollment Parameters menu option lets you define your system configuration, including display type, port assignments, and input device. The user interface works with either keyboard or mouse. I strongly recommend the mouse; the keyboard interface is far less intuitive, and the commands are significantly slower and more cumbersome for some activities. If you do set up with a mouse, however, keep a copy of the program configured for the keyboard—once you've tailored the software for a mouse, trying to reconfigure it without one is, to say the least, exciting.

FACT FILE

PixiScanner
Micro Technologies
921 Royal Heights Rd.
Belleville, IL 62223
(618) 233-2314
List Price: $269
Requires: 256K RAM, serial port plus additional port for the printer.
In Short: This bargain-priced scanner works with most popular dot matrix printers, but only after careful adjustment of the hardware and software. It's best suited for users with patience, small budgets, and good manual dexterity.

CIRCLE 613 ON READER SERVICE CARD

Micro Technologies' PixiScanner comprises a small processing unit that you mount on the front of almost any dot matrix printer, and an optical sensor encased in plastic housing that you attach to the unit's printhead. The processor connects to a PC through a 25-pin connector.

BEEPS The problems with the PixiScanner really begin when you try to calibrate the sensor. Once you've configured the system, you open the Focus Scanner option. The computer greets you with a blast of high-pitched beeps, as the analog data from the sensor is translated into digits on your PC's screen and loud tones on its speaker. The pitch of the beeps varies depending on the screen readout. Mercifully, you can toggle the sound off with a single keypress.

The screen readout ranges from a low of 2 to a high of 15; for proper scanning, you should get 15 for white areas and 2 or 3 for solid black segments. You achieve this ideal by fiddling with the mounting hardware, the white retaining ring, and the sensor, angling it higher or lower and moving it closer to or farther from the page surface. The manual claims there's a screw thread you can use to fine-tune, but unfortunately it doesn't exist on the actual unit. Also, since the optical sensor must be oriented vertically, rotating the tube to make fine adjustments won't work. Your only solution, it appears, is to labor with the hardware until you get the right readings—a task only for someone with fine motor skills and extreme patience.

■ Micro Technologies' $269 PixiScanner has a terminally cute name and attractive documentation.

When you finally get the sensor focused, you can start to scan. After selecting the display resolution (which does not affect the actual scanning resolution), you'll see two screens of control settings. The first presents three color/shading bars

PC WEEK

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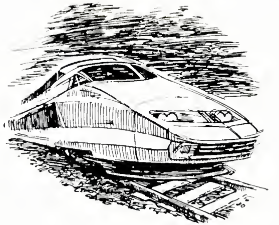
April 14, 1987



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- Hercules Compatible Adapter
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- Desqview
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- 1.2 MB Toshiba Floppy
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- Desqview & QEMM
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CIRCLE 370 ON READER SERVICE CARD

■ The Saba Handscan is best at excerpting a paragraph from a document or a few numbers from a printout.

that let you assign different scanner readings to different display results. The program sets up graduated pattern blocks to cover a range of shades from solid black to white, approximating various shades of gray in between. You can edit these blocks, "ditherize" them to smooth transitions from one reading to the next, and save the settings as a separate parameter file. Also, with an EGA adapter, these blocks can be assigned a color.

The second control screen lets you opt for a reversed image (black displayed as white and white as black), define the area of the original to be scanned, and set the left offset, which tells the printhead where to begin recording an image.

SCRAMBLED LOGO When I first used the PixiScanner, I got to this point without a hitch, and when I told the program to start scanning, the printhead dutifully moved back and forth and the paper fed slowly through the printer. The on-screen results, however, bore no resemblance at all to the *PC Magazine* logo on the paper. I was using an 8-MHz AT and an Epson FX-85, but when I later tried the same procedure with an IBM PC-XT and a Citizen MSP-10 printer, I got similarly scrambled results.

The first few times I tried phoning Micro Technologies for help, I got an answering machine with a voice so convincing that I started explaining my problem before I realized that I was talking to a recording. I didn't get a return call and couldn't get through on the company's modem line, either. I finally secured an after-hours phone appointment; once I got to talk to a live person, it took us more than an hour to figure out the necessary adjustments. It turned out that the problem lay in the printer driver: since I was using an 8-MHz AT, the timings were too slow (though that doesn't explain the problems I had with the XT). Through trial and error, we created six different settings, finally producing an excellent image—which happened to be reversed. Once I had set a "reverse scan" switch in the configuration file, the PixiScanner worked flawlessly.

The problem is, I couldn't have found the correct settings without assistance. The manual briefly mentions the various parameters and gives no clue as to how to respond to different results. Trial and error with the aid of a knowledgeable person seems to be the only solution. Micro Technologies admits that most users end up calling for support when installing their systems. The company reportedly is substantially revising the manual to provide more detail on installation parameters.

The PixiScanner software doesn't permit direct editing of the image. Instead, it stores images in straightforward bit-map form or in more condensed forms, including Macintosh-compatible files that can be read with a variety of programs. You can scan the image as a bit-image file and then recall it and save it in other formats as desired. Recalling the image before storing it in its final format allows you to change the scan parameters to adjust the image. The program also lets you scan to display the image in a low resolution and then reload it in a higher resolution; you store the same amount of data in either case, but the higher-resolution screen gives you a clearer view of the image. Unfortunately, the Pixi-Scanner program lets you print your image using only one of the dot matrix printers that can be used to scan. We had to rely on other software to produce the hard copy for our tests.

PixiScanner has a lot going for it. It's the lowest-priced of the three dot matrix scanners we reviewed, and for that price it gives remarkably good results. It's also versatile, working with so many printers that it will probably work with yours. The adjustments are tricky, however, and the output comes in some unusual forms, so you'll have to make sure you can use the images it produces. The PixiScanner works—but to get results, you'll need patience and time.—**Alfred Poor**

Hand-held Scanners

SABA TECHNOLOGIES INC.

Saba Handscan

At first glance, the Saba Handscan looks like nothing so much as an overgrown five-button mouse. Saba Technologies' literature even occasionally refers to it as a mouse scanner. Looks can be deceiving, as the Handscan is really a flexible OCR scanner in mouse's clothing.

The $649.95 Handscan is the first truly usable hand-held OCR scanner. In 1985 Oberon International introduced the Omni-reader, a $495 scanner that looked like a copy stand with a scanning element that slid on a small rail. The Omni-reader was slow, difficult to use on parts of lines, and misscanned almost every other word, or so it seemed. No longer widely available, Omni-readers can be had for $195 from G.A S. International (Euless, Texas; (800) 523-4898).

While the concept is similar, the two units are worlds apart in performance. The Saba Handscan proved about as reliable as most page scanners.

The Handscan comprises a mouse-shaped scanner, a full-length interface card, software drivers, and five disks of

FACT FILE

Saba Handscan
Saba Technologies Inc.
9300 SW Gemini Dr.
Beaverton, OR 97005
(800) 654-5274
(800) 641-8520 (in Ore.)

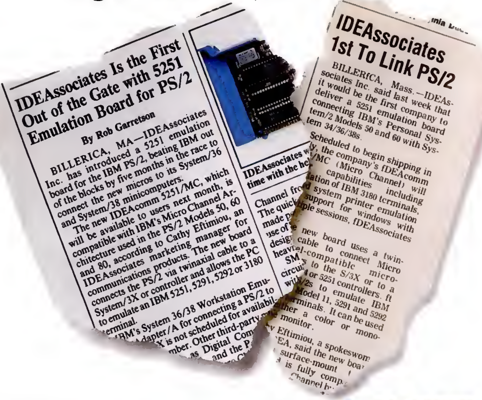
List Price: $649.95

Requires: 512K RAM (640K RAM recommended), two disk drives (hard disk recommended).

In Short: Not for heavy word processing users, this hand-held scanner is good for those who must regularly reenter data from reports into spreadsheets and databases.

CIRCLE 612 ON READER SERVICE CARD

On April 2, IBM made PC history. Eight weeks later, we rewrote it.



IDEAssociates Is the First Out of the Gate with 5251 Emulation Board for PS/2

By Rob Garretson

BILLERICA, MA—IDEAssociates Inc. has introduced a 5251 emulation board for the IBM PS/2, beating IBM out of the blocks by five months in the race to connect the new micros to its System/36 and System/38 minicomputers.

The new IDEAcomm 5251/MC, which will be available to users next month, is compatible with IBM's Micro Channel Architecture used in the PS/2 Models 50, 60 and 80, according to Cathy Eftimiou, an IDEAssociates marketing manager for communications products. The new board connects the PS/2 via twinaxial cable to a System/3X or controller and allows the PC to emulate an IBM 5251, 5291, 5292 or 3180 terminal.

IBM's System 36/38 Workstation Emulation Adapter/A for connecting a PS/2 to ... X is not scheduled for availability ... mber. Other third-party ... as Digital Com... and the P...

IDEAssociates w... time with the he...

Channel fr... The quick... made p... use of ... desig... heavi... SM... circu... wit...

IDEAssociates 1st To Link PS/2

BILLERICA, Mass.—IDEAssociates Inc. said last week that it would be the first company to deliver a 5251 emulation board connecting IBM's Personal System/2 Models 50 and 60 with System 34/36/38s.

Scheduled to begin shipping in ...ly, the company's IDEAcomm .../MC (Micro Channel) will ... capabilities including ...lation of IBM 3180 terminals, ...d system printer emulation ... support for windows with ...iple sessions, IDEAssociates ...

...e new board uses a twin... cable to connect Micro ...el-compatible micro...s to the S/3X or to a ...4 or 5251 controllers. It .../2s to emulate IBM ...Model 11, 5291 and 5292 ...rminals. It can be used ...ther a color or mono... monitor.

...y Eftimiou, a spokeswom... ...EA, said the new boa... surface-mount ... is fully comp... Channel b...

April 2, 1987.

To most computer add-on companies that was the date IBM dropped the bomb. With the introduction of PS/2 personal computers, the Micro Channel* revolution had begun.

The effect on our competitors? Many were prepared to do little more than count big inventories of emulation products for old PCs.

But we were ready.

Within eight weeks we began shipping the first Micro Channel communications product. IDEAcomm 5251/MC.™ The board that connects the new PCs to the System 3X.

How did we do it? The answer is simple. We don't rely on outside development sources. We have our own in-house R&D team. The same team that pioneered Surface Mount Technology (SMT) on computer cards. The very same manufacturing technique used heavily in the PS/2 design.

The result of these efforts is an add-on board that redefines the limits of PC communications. It provides 5292 Model 2 emulation. Support for 132 columns in 3180 emulation. And windows to monitor the real time status of multiple sessions on one PC screen. *Q38 Technical Journal* declared, "... while IDEA is delivering an emulation card that works completely, the other guys are just playing catch-up."

Which, historically speaking, is exactly the position we're inclined to take. For more information on the IDEAcomm 5251/MC, call 800-257-5027.

IDEAssociates™

The Leader in PC Technology.

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CIRCLE 494 ON READER SERVICE CARD

fonts. The connecting cable carries an ominous warning that connecting or disconnecting the scanner with the computer powered up may cause equipment damage, so make sure to tighten the screws. I think that Saba should have found a way to eliminate this potential source of disaster.

To use the Handscan, you load the 157K-byte memory-resident driver, select a font, line up the text with the red lines on the plastic alignment guides, press the square button, and move the scanner along the text. The Handscan will read your document and force the characters it sees into the keyboard type-ahead buffer. If you constantly scan documents in one font, you can save the font in the driver and skip the font selection step.

The hard part is keeping the scanner aligned with the text as you move the scanner. I'd really like Saba to use long rollers like the more expensive TransImage hand scanner to keep the scanner moving in line with the text. A more flexible cable would help, too.

The font selector program will automatically try matching a small sample from your document to each of the fonts it already understands and will tell you how good a match each is, so you can figure out what font to use. It also will let you set the contrast, and the substitution tables, select numbers-only mode, and determine the use of context to help the scanner software decide between such similar characters as 1 and l. You can make the font selector program memory resident so that you can change parameters while scanning documents.

■ Saba expects that the most common use of the Handscan will be scanning numbers from mainframe reports into *1-2-3* spreadsheets.

The substitution table feature allows you to have the scanner substitute any string of characters when it scans a given character. This lets the scanner ignore commas and dollar signs in spreadsheet entries or convert the parentheses around a negative number into a minus sign.

Saba memory-resident programs are not fond of other TSRs. For instance, *Lotus Express* and the Saba software made my PC catatonic.

While you could use a Handscan to read letters, proposals, and other long text documents, these applications are really better suited to a more-traditional page reader. The Handscan is best at excerpting a paragraph from a document or, more commonly, a few numbers from a printout.

Saba expects that the most common use of the Handscan will be scanning numbers from mainframe reports into *1-2-3* spreadsheets. To support these applications, Saba has included, in addition to the usual fonts from daisy wheel printers and typewriters, the fonts for the most common mainframe line printers and laser printers. The scanner's programmable buttons can be used as substitutes for the arrow keys, making it easy to move around the spreadsheet and enter data without using the keyboard.

The Handscan requires some practice, but the average person should be able to scan short lines or numbers with good accuracy in about a half hour and long lines with about an hour's practice.

The Handscan is recommended for people who must regularly reenter data from reports into spreadsheets or databases. Its support for mainframe laser and line printers make it especially useful for entering data from these types of reports. Heavy word processing users should look at more-traditional page scanners.
—Howard Marks

Though the Saba Handscan disguises itself as a five-button mouse, it is really a flexible OCR scanner. The five buttons are completely programmable and can be used as substitutes for directional arrow keys, making it easy to move around spreadsheets.

TRANSIMAGE CORP.

TransImage 1000 System

Reading typeset text has always been the ultimate for OCR scanners. Proportional spacing, multiple typefaces, kerning, and ligatures all make the OCR scanner's job much harder. The $2,595 TransImage 1000 is the first hand-held proportional-space scanner. It also costs less than one-quarter the price of the next cheapest one, the Kurzweil Discover 7320 full-page scanner.

Unlike conventional OCR scanners that read specific fonts, the TransImage 1000 uses pattern recognition techniques to recognize specific characters regardless of font. The TransImage "knows" what the letter *W* looks like and will recognize it in any font. The TransImage 1000 reads all common fonts, including serif and sans

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CIRCLE 143 ON READER SERVICE CARD

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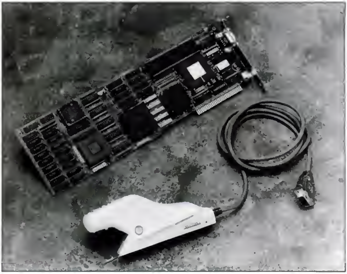
serif, and near-letter-quality dot matrix printing.

These techniques require a lot of computing power, which the TransImage supplies with a Motorola 68000. In fact, the TransImage has more raw power than the AT we used as the test-bed.

The task at hand is made harder because of the human hand. Normal scanners can assume that the scan head is being moved at a constant rate and that the head is moving parallel to the text being scanned. Hand-held scanners move at different speeds with each operator and even at different speeds on the same line. I found I usually sped up at the ends of lines.

It's also nearly impossible for a human to move an object in a straight line for any distance. TransImage has attempted to solve this problem by using two long rollers on the camera that make it track straight.

The TransImage 1000 consists of a full-slot card that holds the 68000, custom VLSI chips, 2 megabytes of working RAM, and the hand-held camera, or scanner. When you press the scan button and scan a line of text, the camera uses an optical RAM to digitize it at 1,000- by 700-dot-per-inch resolution. The card figures out what characters were on the line. Then a memory-resident program (which takes up about 6K bytes) forces the scanner output into the keyboard type-ahead buffer. The camera also has six programmable buttons that can send any string when pressed, like a keyboard macro. These buttons default to the four arrow keys, Esc, and Enter.



The TransImage 1000 System, the first hand-held scanner to read proportional spacing, has an interface card with o Motorolo 68000 microprocessor, custom VLSI chips, 2 megabytes of RAM, and six programmable buttons that defoult to directional keys, Esc, and Enter.

FACT FILE

TransImage 1000 System
TransImage Corp.
910 Benicia Ave.
Sunnyvale, CA 94086
(408) 733-4111
List Price: $2,595; Applications Developer, $395.
Requires: 384K RAM (640K RAM recommended); two disk drives (hard disk recommended); CGA, EGA, or compatible graphics adapter.
In Short: A hand-held proportional text scanner that lets you scan small chunks of typeset material.

CIRCLE **611** ON READER SERVICE CARD

TransImage's optional Application Bridge allows you to program the six buttons and lets you define what characters to generate when you reach the end of the line, or encounter vertical bars or an unrecognized character. TransImage has preprogrammed these functions for several popular applications.

The card uses one interrupt request, one DMA channel, and four I/O ports. All are switch selectable, and the default settings worked fine in both systems we tested it in.

OPERATION To use the TransImage 1000, first run the setup program that loads microcode and character descriptions into the interface card and allows you to set some system parameters, such as what to do at the end of a line. After the system is set up, text scanned by the TransImage 1000 appears to your PC as keyboard input. The TransImage software also allows you to change the exposure (like the f-stop on a camera) for different text samples. A utility is provided to help you choose the best exposure for any given sample.

TransImage provides a utility for teaching the scanner a new font or a new character set such as Cyrillic.

The TransImage 1000 is not difficult to use, but you have to be careful to scan straight across the line of text. It takes about 2 hours of practice to accurately scan text. TransImage claims that the TransImage 1000 can scan text at 40 characters per second with 99.6 percent accuracy. Both maximum scan rate and accuracy are affected by the material being scanned, exposure, and operator experience.

■ It takes 2 hours of practice with the TransImage 1000 System to accurately scan text.

The TransImage 1000 couldn't read dot matrix boldface or underlined text accurately. On the underlined text, it even had

EDITOR'S CHOICE

- **Dest PC Scan Plus**
- **Kurzweil Discover 7320**
- **Microtek MSF-300C**

If you're after a general-purpose scanner, consider the Dest PC Scan Plus. This system does both graphics and OCR reasonably well, although the graphics scanning software does not offer as much control as some other packages and the OCR is limited to monospace characters. The system's Microsoft Windows *integration provides a consistent interface for both graphics and OCR, and its ability to scan formatting in standalone OCR mode is on a par with that of systems costing much more.*

The Kurzweil Discover 7320 offers exceptional OCR capabilities for typeset text. After scanning pages from various magazines, newspapers, books, and advertisements, we can recommend the Kurzweil as being for and away the best desktop OCR on the market. In addition, Kurzweil wisely placed the OCR intelligence on a coprocessor board so that you get maximum performance no matter what system you use.

The Microtek MSF-300C is our choice for graphics scanners. The flatbed lets you adjust alignment and scan virtually anything you wish to place on the scan bed. Unlike most scanning software, which uses a single pattern (dithering) for halftone dots, Microtek's EyeStar Plus *lets you control the size and shape of halftone dots, making for better scanning of continuous-tone images. The trade-off is that a flatbed scanner isn't great for OCR.*

In addition, we reviewed scanners in two specialized categories: printhead attachments and handheld units. The printhead scanners were hard pressed to match the dedicated scanners; of the four we reviewed, the Epson Image Scanner Option Kit fared best. For people who need to scan only portions of documents, the monospace-only Saba Handscan is a workable alternative; the more expensive $2,595 TransImage 1000 System reads proportional fonts but, on our samples at least, not well enough to justify a recommendation.

trouble with characters without descenders. The TransImage 1000 also scans any area of white space as one character space.

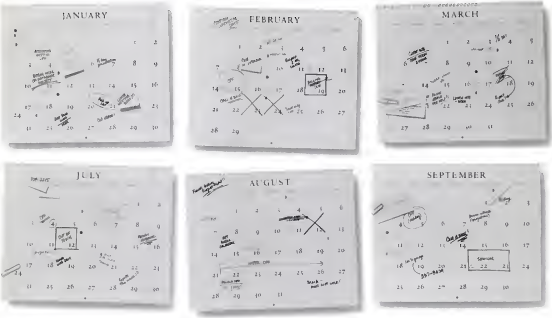
In the testing that I did, my accuracy was never better than 85 percent. The TransImage 1000 also did much better on mixed uppercase and lowercase text than on all uppercase. Accuracy on assembler listings from the Productivity section of *PC Magazine* was only 60 percent.

The critical question is, who needs a hand-held scanner? It requires a skilled operator and doesn't enter data any faster than a skilled typist. It may be useful for entering numeric data into your spreadsheets, but I can't see spending $2,595 to enter *Newsweek* articles into my computer or to scan *PC Magazine* program listings, especially not at that error rate.

At that price and accuracy level, the TransImage 1000 may be seen as technology in search of a problem. At 3½ times the price of the Saba unit, you've got to ask long and hard questions about how often you'll be scanning small chunks of proportionally spaced or typeset material. TransImage may find a stronger market incorporating its character recognition into a full-page scanner, at a price that could be a third of the Kurzweil Discover 7320.

—Howard Marks

"I FLIPPED TH
OF PAGES TRYING TO



Choosing the wrong database management software can be like doing time.

Ask Harry Viens, the executive vice-president of an advertising agency.

Using a copy of dBASE,® he spent a year trying to learn its programming language to develop applications on the agency's PC to track income against forecasts.

But with dBASE, all he ended up with was wishing he'd used R:BASE® System V, the database software you don't have to be a programmer to use.

"AFTER USING dBASE I HAD TO BE DEPROGRAMMED."

Viens knew his mini-computer was fine for bookkeeping, but wasn't capable of turning around management reports—critical for making quick decisions.

"We've got to make decisions in real time, not wait a couple of months to find out what's happening today," Viens said.

"I tried to build this dBASE application nights, weekends and during holes in my schedule. But almost a year later, the miserable thing still wasn't done," Viens told us.

"The language is unnatural. I guess some people love writing code. For me, that's like trying to mow the lawn with nail clippers."

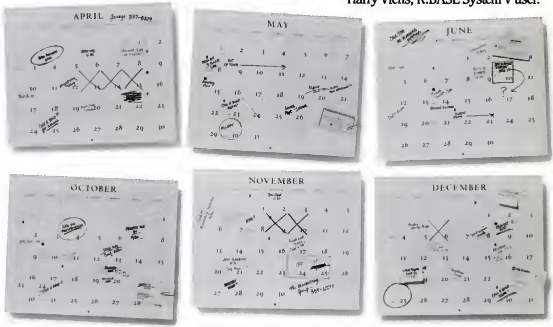
"I SAW, AND I BELIEVED."

Being an advertising person, Viens actually reads ads. He saw our claim that you don't have to be a programmer to use R:BASE, and bought it.

Because of our EXPRESS System, he was

ROUGH A LOT FIGURE OUT dBASE."

—Harry Viens, R:BASE System V user.



able to build the kind of application you'd expect in a custom program from a professional programmer. All without having to write one line of code.

"It took me just three days to do it working part-time," Harry said. So now he can track his forecasts and break them out by the account person who made them.

"R:BASE System V is an amazing product. Despite its power you never seem to get trapped in a corner you can't get out of."

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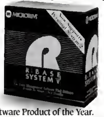
From Alaska and Canada, call 1-206-867-1800, Department PM1013.

We can also put you in touch with an authorized Microrim dealer who will take you through the software firsthand. It will be time well-spent.

R:BASE SYSTEM V
MICRORIM



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The 5.25-inch formats run on IBM PC, XT, AT and 100% compatibles, and on all major LANS, with no additional cost for extra users attached to the server. The 3.5-inch formats run on IBM PS/2 and other 100% MS-DOS compatibles. Trademarks/Owners: Microrim, R:BASE/Microrim, Inc., IBM, PS/2/International Business Machines, Inc., dBASE/Ashton-Tate Corporation, InfoWorld/CW Communications, Inc. © 1987 Microrim

CIRCLE 366 ON READER SERVICE CARD

Before you choose between the best PC terminals, read this head-on comparison.

Totally compatible with the IBM AT, right down to keyboard layout. But with a more resilient feel.	Likewise.
14", 132 column, high resolution screen gets more out of programs like Multiplan and Lotus 1-2-3.	Likewise.
Boosts productivity with easy to read character set and advanced ergonomics.	Likewise.
Manufactured, serviced and supported by the company that ships more terminals than anyone but IBM.*	Likewise.
At $599, the Wyse WY-60 delivers unrivaled value if you're looking for sharp resolution, advanced features and superior overall quality in an AT-compatible alphanumeric terminal.	At $649, the Wyse WY-99GT delivers likewise in a graphics terminal, with Hercules and IBM CGA compatibility.

So if you're looking for the best terminal to turn your AT into a multi-user system, there's really no choice like Wyse. For more information, call 1-800-GET-WYSE.

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We make it better, or we just don't make it.

Trademarks/Owners: Wyse, WY 60, WY-99GT/Wyse Technology, IBM AT, IBM CGA/International Business Machines, Hercules/Hercules, Lotus 1-2-3/Lotus Development Corporation; Multiplan/Microsoft. *IDC 1986 U.S. Terminal Census.

CIRCLE 734 ON READER SERVICE CARD

■ COMPUTERS ■ ALFRED POOR

With all the attention given to the new, furiously fast 386 machines, you may wonder about the current value of 286 technology. In this review of 286 AT compatibles we make comparisons that indicate that slow-and-steady sometimes wins the race.

286 AT COMPATIBLES: KEEPING PACE WITH THE 386

"Three-eighty-six" is a phrase that quickens the pulse among PC aficionados. Ever since Compaq rolled out its Deskpro 386 in September 1986, power users and status seekers have known which chips *had* to be in their machines.

While AT-class 80286-based machines no longer can lay claim to being the fastest in the DOS stable, they haven't lost any of their speed, except in a relative sense. In fact, they've continued to gain power, from the 6 MHz of the first IBM PC ATs in August 1984 to the current 8 MHz PC AT and a slew of AT compatibles running at 8 to 14 MHz. In this review PC Labs examines seven AT compatibles from American Research Corp., FiveStar Computers, Ind-Tech, Mitsubishi Electronics America, PC Designs, Standard Brand Products, and Wang Laboratories that range in speed from 8 to 12 MHz.

286-Based ATs: Summary of Features

(Products listed in ascending base-price order)

	FiveStar FS-286 FiveStar Computers	**Standard 286/12** Standard Brand Products	**IndTech 5191** IndTech	**ARC Turbo 12** American Research Corp.	PC **PC Designs GV-286** PC Designs Inc.
Base price	$1,295	$1,495	$1,895	$1,925	$2,435
BASE PRICE INCLUDES					
RAM	640K	1 Mbyte	512K	512K	1 Mbyte
Floppy disk drives	1 1.2-Mbyte or 360K	1 1.2-Mbyte	1 1.2-Mbyte	1 1.2-Mbyte	1 1.2-Mbyte
Hard disk drives	None	None	None	None	None
Clock/calendar	●	●	●	●	●
Software	DOS, BASIC	None	DOS, BASIC	DOS	*DESQview*
Monitor	None	None	None	None	None
Ports	1 parallel, 2 serial	2 parallel, 1 serial (but with cables for 1 of each)	None	None	1 parallel, 2 serial
Slots	12	8	12	8	8
Power supply (watts)	238	200	238	200	200
Reset key	●	○	●	○	●
Keyboard style	IBM enhanced	Original AT	IBM enhanced	IBM enhanced	IBM enhanced
CONFIGURATION TESTED					
Price	$2,395	$2,348	$3,715	$3,323	$3,199
Configuration	Monochrome/graphics, dual-frequency monitor, 512K memory upgrade, 60-Mbyte hard disk, extra floppy disk drive	Monochrome/graphics card and monitor, 43-Mbyte hard disk, 360K AT floppy disk drive	I/O ports, 1 Mbyte RAM, 45-Mbyte hard disk	Monochrome monitor with white phosphor screen, 1 Mbyte RAM, 30-Mbyte hard disk	Monochrome display adapter, monochrome monitor, 20-Mbyte hard disk
SPECIFICATIONS					
Clock speed (MHz)	6, 10	6, 12	8, 10	6, 12.5	6, 12
Controller card handles	2 hard and 2 floppy disk drives	2 hard and 2 floppy disk drives	2 hard and 2 floppy disk drives	2 hard and 2 floppy disk drives	2 hard and 2 floppy disk drives
IBM EGA compatible	●	●	●	●	●
Above Board compatible	●	○	●	●	●
OTHER					
Warranty	1 year	1 year	1 year	2 years	1 year
BIOS manufacturer	Trigem Computer	Eden	IndTech	American Research Corp.	American Megatrends

PC—Indicates Editor's Choice ● — Yes ○ — No

These ATs and others reviewed before them have some distinct advantages over the ever-growing collection of 386-based machines. Foremost is bang for the buck. While they aren't as fast as 16-MHz 386 PCs, they're clearly cheaper. For instance, a 12-MHz Compaq Deskpro 286 (see "Compaq's Deskpro 286: The 12-MHz Champ," *PC Magazine*, Volume 6 Number 12) costs almost 30 percent less than a similarly equipped Deskpro 386; an 8-MHz Tandy 3000 is about 25 percent cheaper than Tandy's new 386-based 4000.

All these AT compatibles use the original IBM expansion bus, which means you won't have to wait for the third-party add-in boards that are yet to surface in quantity for IBM's PS/2 line. And they'll run both DOS and OS/2 once OS/2 surfaces, just as 386 machines and PS/2s do.

Looking at this collection of seven new AT compatibles, it would appear that 286 technology continues to retain its value and to offer reasonable alternatives to the newer and flashier 386-based machines, and different companies have chosen some unique strategies to maximize their ability to compete in the marketplace.

HIGH-SPEED DANGER Some manufacturers have gone after high speed with their AT compatibles. In early experimen-

Mitsubishi MP286 Mitsubishi Electronics America inc	**Wang 280** Wang Laboratories Inc.
$2 495	$3 850
640K	640K
1 1 2-Mbyte	1 1 2-Mbyte
None	None
●	●
DOS, BASIC	DOS, BASIC, *Microsoft Windows*
None	None
1 parallel, 1 serial	1 parallel, 1 serial
6	8
135	229
●	
IBM enhanced	Wang
$4,495	$5,825
EGA color monitor, 42-Mbyte hard disk	Multifrequency color monitor, 34-Mbyte hard disk
6, 7, 15, 8	6, 8 10
2 hard disk drives (motherboard handles 2 floppy disk drives)	2 hard and 2 floppy disk drives
●	●
●	●
1 year	1 year
Mitsubishi	Phoenix

tation with faster clocks, users discovered that there could be a high price to pay for increased speed. Some add-on boards would function erratically or not at all when dropped into ATs running at clock speeds of 12 MHz and above. The demands on chip components were increased dramatically as processor speeds accelerated, and many slower memory chips just could not perform reliably (see "High-Speed ATs: Life in the Fast Lane," *PC Magazine*, Volume 6 Number 7).

Manufacturers have gone to some length to solve the problems encountered with earlier fast 286 machines. Most have engineered their computers from the ground up, with proprietary motherboards, custom-written and -tuned ROM BIOS code, and clever bits of design, such as the slowing down of expansion bus access to accommodate slower expansion boards. Many of the manuals for these machines also include warning notes and admonitions to be sure to use 100-nanosecond or 120-nanosecond memory chips for reliable operation. (Smaller numbers mean faster chips; an 8-MHz AT works with 150-nanosecond chips.)

■ While the 286 technology is not state of the art anymore, it certainly isn't ancient history, either.

As a result, some of these new machines turn in impressive benchmark-test performances. 10-MHz machines with no wait states are running 50 percent faster than the 8-MHz IBM PC AT. (For a look at several computers in this category, see "10-MHz Computers: High Speed, Low Risk," *PC Magazine*, Volume 6 Number 8.) One 12-MHz machine (the PC Designs GV-286) uses special high-speed static RAM to cache memory address requests, pushing performance for many operations within close striking distance of the Compaq Deskpro 386's scores.

NEW STANDARD WORKHORSE
Some manufacturers have taken a lower road to AT success with their new models. Not many users need the turbocharged performance of a 386 to perform simple word processing or spreadsheet tasks. These people could get by on an 8088 machine, but new displays and *Windows*-based applications and operating systems beg for better performance. AT-style technology running at 8 to 10 MHz jazzes up performance while keeping costs down.

It may well turn out that the desktop workstation of the near future will be a 286-based machine, not the 386 that so many industry observers have flipped over. The typical configuration will have an 80286 CPU running at a once-risky, but now-respectable 8- to 12-MHz clock speed, a megabyte or so of RAM, a 640 by 480 EGA-plus adapter (or 640 by 480 VGA, which includes EGA compatibility), and either a hard disk or floppy disks plus a network card—all at a $2,500 to $3,000 price level, equivalent to that of a PC or XT just a few years ago. There are a number of machines reviewed here that can compete on those grounds.

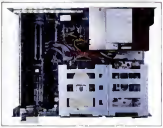
There are also those manufacturers that need to offer an AT solution to their installed customer base even at the same time as they are rolling out 386-technology products. Such is the case with Wang, whose 280 represents an interesting blend of the old with the new, the standard with the proprietary.

All of these machines have merit, and some offer surprising value for their purchase price. Is the 286 dead? While the technology is not state of the art anymore, it certainly isn't ancient history, either. As these seven computers ably demonstrate, there are still plenty of good reasons to buy an AT-style machine. Let users with ultra-high speed demands pursue the latest and greatest; many of the rest of us can still meet our needs with an AT compatible and walk away holding onto a bit more of our assets when we're done.

AMERICAN RESEARCH CORP.
ARC Turbo 12

How fast is fast? You can tell just by looking at your screen whether or not your application is running quickly, or you can test your computer by running some standard benchmark programs such as the ones we use in PC Labs. But how can you tell how fast your computer is running while you are working with it?

If you have an ARC Turbo 12, from American Research Corp., you can tell with just a glance at the front panel. There you will find a large, three-digit LED display that shows the MIPS being performed



An LED on the front panel of the ARC Turbo 12 tells you how fast your computer is running by showing the MIPS (million instructions per second) being performed at that moment. Aside from these unusual indicators, the Turbo 12 has many of the same characteristics of other 286s, including five half-height disk drive bays and eight expansion slots.

■ The ARC Turbo 12 offers something to measure as it blasts along at 12.5 MHz.

by the machine at that moment. For those less technically minded who may not exactly be familiar with the jargon, MIPS stands for "million instructions per second" and generally is reserved for measuring mainframe performance; 8088-based PCs produce only fractional MIPS measurements.

The Turbo 12 offers something to measure, however, as it blasts along at a 12.5-MHz CPU clock speed. The actual MIPS displayed on the panel varies, depending on the operations in effect at the time, but during our tests it ran as high as 2.4 MIPS.

The MIPS Meter readings corroborated the results of the PC Labs benchmark tests. In the processor and memory tests, the unit ran 50 percent faster than an 8-MHz IBM PC AT in every test except the extended memory test (in which the two machines were approximately equal). Unfortunately, the hard disk supplied by ARC with the evaluation unit had a speed rating of only 40 milliseconds, equal to that of an IBM PC AT but the slowest of any of the machines included here, so the disk access times were not in the same league as the CPU benchmark tests.

The front panel also has a speed indicator. When in the "slow," 6-MHz speed, a light labeled Cruising is lit, along with a symbol of a jet fighter in horizontal flight. A small dot halfway up a line graph on a grid background also glows. Press Ctrl-Alt-Minus and the label Accelerate lights up, along with a higher dot on the graph and a jet angled upward in a 45-degree climb. The front panel leaves no room for doubt about whether you are in the fast or slow clock speed mode.

CLEAN LINES Aside from the front panel indicators, the Turbo 12 is similar to other 286s. Its full-size case has its own clean lines, rather than slavishly following the appearance of the original IBM PC AT, but it still has the same five half-height disk drive bays, only two of which are open to access from the outside. Inside are the typical eight expansion slots: two 8-bit and six 16-bit. The motherboard holds a megabyte of memory.

One feature that is different on the inside is the battery backup for the CMOS configuration RAM. Most machines use a lithium battery that is hard to find and expensive to replace. The Turbo 12 instead

PC MAGAZINE FACT FILE

ARC Turbo 12
American Research Corp.
1101 Monterey Pass Rd.
Monterey, CA 91754
(800) 423-3877
(213) 265-0835 (in Calif.)

List Price: With 512K RAM, two 1.2-Mbyte floppy disk drives, clock/calendar, DOS, $1,925; 1-Mbyte RAM expansion card, $99; color/graphics monitor, $499, EGA monitor, $899; 360K-byte floppy disk drive, $109; 1.2-Mbyte floppy disk drive, $139; AT mini I/O card with serial, parallel, and game ports, $129; second serial port, $49.

In Short: This AT compatible is a high-quality machine, but when configured it becomes slightly overpriced in comparison with some of its competition.

CIRCLE **698** ON READER SERVICE CARD

Photographs: Roberto Brosan

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When you're ready to stop working in slow motion, you're ready for the speed and raw power of the CPU Mini 286.

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Call **1-800-824-2936.**
In California,
1-800-662-6111.

Computer Products United

CIRCLE 163 ON READER SERVICE CARD

has a simple white plastic case that houses a carrier for four standard alkaline penlight batteries. They may not last as long as lithium batteries, but they will certainly be less expensive and easier to find.

The configuration RAM also is easy to set up. Like many other computers, the Turbo 12 relies on a separate utility program (as opposed to the handier setup program in ROM found on some machines). The program is named FSETUP, which stands for "friendly setup." The program presents a window with a fill-in-the-blanks data entry form. Novice users should find it easy to use, and there is even an on-line help feature included.

ARC seems to have put a great deal of effort into designing the appearance of its product, as is indicated by the user interface of the setup program, the unique look of the case, and the MIPS Meter display. The Operating Manual provides further evidence, although the results are of questionable value. The standard-size binder is filled with glossy cardboard dividers printed with full-color photographs of the company logo or the computer. Literally half of the first 20 pages are these cardboard illustrations (all the same), alternating with 10 beautifully designed pages that contain the standard FCC radio frequency interference statement. The rest of the manual is written for the novice user, yet the content is thin. The best part of the manual is the technical appendix that lists bus pinouts, memory maps, and a block diagram of the motherboard circuitry.

At a price of $3,323 (for the configuration tested), the Turbo 12 is priced higher than some other machines with similar performance marks, and about the same as ones with better benchmark-test results. Its comparatively slow hard disk does not help its case any. It is good-looking and an above-average performer, but at this price it is not a particularly standout value.

FIVESTAR COMPUTERS

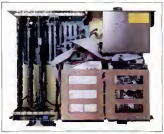
FiveStar FS-286

If you are looking for an AT that does not suffer from typical design constraints, consider the FiveStar FS-286.

According to a FiveStar Computers representative, the "S" stands for slots. And slots it has, enough to satisfy even the most board-crazed fanatic. It comes with grand total of 12 slots, of which 4 are 8-bit and 8 are 16-bit. Two of each are half-length, which leads to a curious problem: one of the half-length 16-bit slots is unusable when a hard disk is installed since the card edge connector extends under the cable connector on the back of the hard disk.

■ An unusual aspect of the FiveStar FS-286 becomes apparent when you look at its motherboard: it doesn't have one.

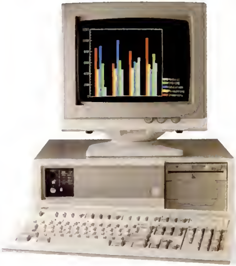
Another unusual aspect of the FS-286 becomes apparent when you look at its motherboard: it doesn't have one. Instead, it relies on a CPU card and a separate combination I/O and memory card to perform the motherboard functions. This is not a unique setup. Other computers, including some Zenith models, use a similar design. The CPU card does not have any particularly unusual features, except that it does offer a handy reset button that is mounted on the back of the card mounting bracket. This design makes upgrades incredibly easy; FiveStar originally sent an 8-MHz machine to evaluate in error, and all the company had to do was send a new CPU



If you need a machine with plenty of slots or disk drive bays, the FiveStar FS-286 could be for you. It offers a grand total of 12 slots (4 8-bit and 8 16-bit slots) and bays for six half-height devices, four of which are accessible from the front. Some banks on the memory card are left open, allowing for a full 2 megabytes of RAM without the addition of more memory cards.

A Lot Of Promises.

A Lot Of Performance.



Take a close look at these two machines. At 10 MHz, operating at one wait state, you might believe IBM's® Personal System/2™ Model 50 is one of the fastest 80286 computers available. Fact is, an InfoWorld benchmark test ranks the AST Premium/286's™ CPU performance number one.

You might also think IBM's system is the first to take advantage of powerful multitasking operating system software. And you'd be wrong again. When we introduced the AST Premium/286 a year ago with advanced FASTslot™ architecture, we designed a home for Microsoft's® MS OS/2.™ In fact, it delivers all zero wait-state memory for MS OS/2.

Of course, MS OS/2 may not be available for a while. Which is okay, if you have an AST Premium/286. Built into every system is AST's Enhanced Expanded Memory (EEMS), allowing EEMS software such as Windows™ 2.0 and DESQview™ to multitask existing applications... today.

So, hold on to any of your existing off-the-shelf application software. As long as it's AT®-compatible, it will run on the AST Premium/286.

What can the competition offer you today? Promises for the future. We can't wait that long. And neither should you.

If you want more than promises, make a commitment to the company that has already delivered proven performance. As PC Magazine said when we received the Editor's Choice award, "The Premium/286 is without a doubt the best-looking and best-performing system with a 10 MHz rating."

We could make promises about the future too. But, as you can see, and will continue to see in the coming months, we'd rather deliver. Call us today **(714) 863-0181** to investigate the Premium/286's finer details.

PC MAGAZINE EDITOR'S CHOICE

Benchmark Test Results
For Selected Performance Computers

CPU measures main processor performance relative to the 6-MHz (Model 099) IBM PC AT. Hard disk performance is tested for sequential and random data access.

SYSTEM (80286-BASED PCS) (Clock speed in MHz/No. of wait states)	**CPU**	**Hard Disk** (sequential)	**Hard Disk** (random)
AST Premium/286 (10/0)	***2.25***	***1.41***	***2.12***
IBM PC AT (6/1)	1.00	1.00	1.00
IBM PC XT™286 (6/0)	1.32	1.33	1.03
IBM PC AT (8/1)	1.37	1.17	1.40
IBM PS/2 Model 50 (10/1)	1.71	1.70*	1.19*
IBM PS/2 Model 60 (10/1)	1.72	2.02	1.67

*With RAM cache: seq. 1.92, ran. 1.03
Source: InfoWorld Hardware Benchmark System, as published in InfoWorld May 11, 1987

PC 10/13/87

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AST® RESEARCH INC.

card to turn it into the current 10-MHz model.

The memory card has its chips installed in an unusual pattern. The base model comes with 640K bytes of RAM installed. The first 512K is in the form of soldered chips in banks 4 and 8. The remaining 128K is installed in sockets with 64K chips in banks 3 and 7. The evaluation unit also had a 512K upgrade, which used socketed 256K-bit chips in banks 2 and 6, leaving banks 1 and 5 open. The design is not intuitive, but it does allow for a full 2 megabytes of RAM without the addition of memory cards. On the downside, that the chips are soldered in the first 512K means that they are not user-replaceable.

The FS-286 also uses an unusual battery to back up the clock and the CMOS setup data. It is a coin-shaped battery, reminiscent of those used on some of the early multifunction cards, and it may be difficult to locate a replacement when it wears out.

The case is a fairly standard looking full-size style, with one major exception. The typical IBM PC AT–style case has bays for five half-height devices, only two of which are open to the outside for access. The FS-286 offers bays for six half-height devices, and four are accessible from the front (the top two bays on each side).

Benchmark Tests: 286-Based ATs

The big surprise of the benchmark-test results is the remarkable performance of the PC Designs GV-286 in both processor and memory tests. Some of its times are almost twice as fast as those of the IBM PC AT, and the machine gives the Compaq Deskpro 386 (which runs at 16 MHz) a real challenge. The credit for this performance goes to the high-speed static RAM that PC Designs has included in the GV-286. Note that all the machines outperform IBM's aging AT, proving that while 286 technology is no longer on the cutting edge, it does continue to improve.

The **NOP** benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K loop.

The **80286 Instruction Mix** benchmark test measures the time it takes to execute a selected series of processor-intensive tasks. The test program uses 80286 instruction code. These instructions are a subset of the total processor instruction set.

The **Floating-Point Calculation** benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentiation, and logarithmic and trigonometric functions. The benchmark program uses the floating-point library included with Microsoft C Compiler 4.0.

Performance Times

(Times given in seconds except where noted)

	NOP	80286 Instruction Mix	Floating-Point Calculation	Conventional Memory	BIOS Disk Seek (milliseconds]
IBM PC AT (8 MHz)	4.17	8.96	35.60	1.32	37.19
Mitsubishi MP 286	4.18	7.03	28.12	0.93	27.81
FiveStar FS-286	3.35	7.08	27.98	1.00	26.49
Wang 280	3.35	7.08	28.01	1.02	29.15
IndTech 5191	3.35	5.54	22.23	0.74	30.15
ARC Turbo 12	2.84	5.97	23.56	0.86	37.62
PC Designs GV-286	2.80	4.78	18.82	0.71	24.72
Standard 286/12	2.78	5.82	23.16	0.84	32.68
Compaq Deskpro 386 (16 MHz)*	2.09	4.23	15.50	0.72	27.03

*The Compaq Deskpro 386 was tested using the 80386 Instruction Mix test.

FACT FILE

FiveStar FS-286
FiveStar Computers
3220 Commander Dr., #102
Carrolton, TX 75006
(800) 752-5555
(214) 733-4100 (in Tex.)

List Price: Model S^{10} with 640K RAM, one 1.2-Mbyte or one 360K-byte floppy disk drive, clock/calendar, DOS and BASIC, one parallel and two serial ports, $1,295; monochrome monitor, $149; 512K-byte RAM expansion card, $69; 40-Mbyte hard disk drive, $695; 60-Mbyte hard disk drive, $795; 100-Mbyte hard disk drive, $1,095; 230-Mbyte hard disk drive $2,295; extra floppy disk drive, $90.

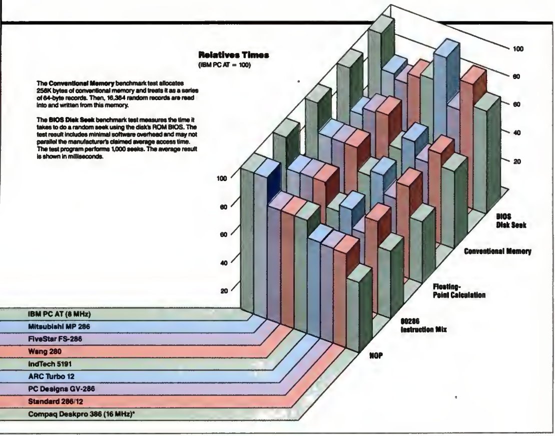
In Short: The FiveStar has the lowest base price and the best-configured system value of the machines reviewed in this article, but it has some unusual design features that make it less attractive. The abundance of slots and disk drive bays is a definite plus, but only for those users who are likely to need all that expansion room.

CIRCLE **697** ON READER SERVICE CARD

The case also has cutouts for mounting port connectors, but only one was in use on the evaluation machine. The memory card includes two serial ports and one parallel port. The parallel connector and a nine-pin serial connector are included on the card-mounting bracket. The second serial port has a 25-pin connector mounted in one of the case cutouts. A second parallel port came with the monochrome graphics card included in the evaluation unit.

TYPICAL KEYBOARD The computer comes with a typical clone keyboard: the MaxiSwitch 101-key model. This is switchable for use with either XT- or AT-type machines, so if you decide you don't like it you can give it to someone to try with his machine. The MaxiSwitch is a fairly good keyboard with fair physical feedback, but it requires a slightly heavy touch since the "over-center" resistance is somewhat higher than on other keyboards. This keyboard (also used on the PC Designs GV-286) was my second choice for feel behind the Wang 280's.

The system comes with attractive documentation (again, second only to that packaged with the Wang). Bound in simulated-leather binders, the DOS, BASIC, and Operations Manuals are thorough and well illustrated. The Operations Manual not only provides good information for the novice on how to set up and use the com-



The **Conventional Memory** benchmark test allocates 256K bytes of conventional memory and treats it as a series of 64-byte records. Then, 16,384 random records are read into and written from this memory.

The **BIOS Disk Seek** benchmark test measures the time it takes to do a random seek using the disk's ROM BIOS. The test result includes minimal software overhead and may not parallel the manufacturer's claimed average access time. The test program performs 1,000 seeks. The average result is shown in milliseconds.

- The IndTech expands upon the traditional AT design by offering two pairs of openings to half-height disk drive bays.

puter, but there is also plenty of technical information about the CPU, keyboard, memory map, DOS interrupts, and other points of interest to programmers.

The FS-286 was one of the lowest-priced systems tested, with a base price of $1,295 and a fully configured system price of $2,395 (which includes a 60-megabyte Priam hard disk). Its combination of features make it the best bargain on a dollar-per-feature basis, and its 10-MHz CPU performance is no slouch. Still, it has some design features (such as the soldered RAM) that make it less attractive than some of the alternatives.

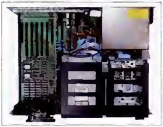
For a hardware nut who needs lots of disk drive bays or slots, the FiveStar FS-286 is a good choice. Few people will need all of its expansion potential, and unless price is the governing factor in the purchase decision, a more mainstream choice would be preferable.

INDTECH

IndTech 5191

The IndTech 5191 is an AT compatible with a few interesting wrinkles. One look at it shows that it is a perfectly respectable computer, but the central question is whether or not it is worth the mid-range price tag given it by IndTech.

From the front, the IndTech expands upon the traditional AT design by offering two pairs of openings to half-height disk drive bays. This arrangement should satisfy all but the most storage-crazed users, providing access to full-blown configurations such as two floppy disk drives, a tape drive unit, and a removable hard disk, all without resorting to external housings. There is, in fact, an additional half-height



Two pairs of openings to half-height disk drive bays on the IndTech 5191 provide access to full-blown configurations without resorting to external housings. The machine also offers an additional half-height bay not open to the outside, and a motherboard with 12 expansion slots. A CPU that runs with no wait states and some sly memory management techniques boost the machine's speed.

bay that is not open to the outside.

Inside, the expansive design continues. Like the FiveStar FS-286, the IndTech has a motherboard that offers a grand total of 12 expansion slots. Hardware junkies will be hard-pressed to fill this box with its six 16-bit full-length and six 8-bit slots (two full-length, four half-length). The evaluation unit came with a Western Digital hard/floppy disk drive combination controller, a VEGA half-length EGA card, and a half-length I/O port card, and the insides still looked barren; the first seven of the eight full-length slots were empty.

The back of the case includes knockout panels for mounting D-connectors for I/O ports. The card that came with the evaluation unit included a parallel port and a 9-pin serial port on the card-mounting bracket, and an extractable lead to a second serial port with a 25-pin connector mounted in one of the case openings. The back panel also included a system hardware reset switch, which was not particularly accessible but nice to have all the same.

The keyboard had no brand name on it but appeared to be a copy of a MaxiSwitch 101-key keyboard. The copy was faithful right down to the XT/AT switch on the bottom. Unfortunately, the keys did not have as good a feel as those of the MaxiSwitch, with little "over-center" feedback and a touch that was too stiff for my personal taste.

The IndTech is rated at 10 MHz, yet its benchmark-test results are closer to those of the 12-MHz machines. According to a company representative, this is due to the fact that the CPU runs with no wait states and that IndTech has engineered some proprietary memory management techniques that boost performance without resorting to cache memory.

THOROUGH MANUAL The computer comes with DOS, BASIC, and a full set of documentation. The users' manual is thorough and includes concise information with plenty of illustrations for the novice user. For more-advanced users, the manual includes a host of technical details about pin-out assignments, bus connectors, interrupts, memory maps, and more.

This attention to technical detail is not surprising, given the company's background. A maker of microprocessing equipment for industrial applications, IndTech started out designing rack-mounted devices. Its move into the desktop PC market was driven in part by client demand for better systems for industrial applications. This also explains the great expansion potential of the machine, with its space for plenty of add-in boards and special controller cards. IndTech designed a great deal of the machine from the ground up, even to the point of developing its own BIOS.

The final price of the evaluation unit was $3,715, which did not include a moni-

FACT FILE

IndTech 5191
IndTech
1275 Hammerwood Ave.
Sunnyvale, CA 94089
(408) 743-4302

List Price: Model 301 with 512K RAM, two 1.2-Mbyte floppy disk drives, clock/calendar, DOS and BASIC, $1,895; Model 303 with 1 Mbyte RAM on motherboard, 45-Mbyte hard disk drive, $3,495; I/O card, $105; 84-key keyboard, $95; IBM enhanced keyboard, $115.

In Short: While the IndTech 5191 offers excellent speed for a 10-MHz machine and extraordinary expansion potential, its base price covers only the basics. When configured, it does not represent as good a value as some of the alternatives.

CIRCLE **696** ON READER SERVICE CARD

Mitsubishi Makes Today's Selection Of A Personal Computer A Little Easier.

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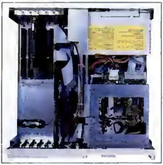
Xenix is a registered trademark of Microsoft Corp.

CIRCLE 373 ON READER SERVICE CARD

tor but did include a 45-megabyte hard disk. Note that IndTech does not sell directly to end users, unlike many of the other companies whose products are reviewed here. As a result, the IndTech products may be discounted by dealers, especially when purchased in quantity. If the extra expansion capability of the machine meets special needs you may have, contact a dealer to get a system price quote before making a final decision. You can contact IndTech for the names of dealers.

When compared on the basis of its basic list price, however, the IndTech 5191 does not represent a sufficiently attractive value. For the same money or less, you can purchase a machine with better performance or similar expansion capabilities. There is not enough that is different about this one to warrant choosing it over some of the alternatives.



The Mitsubishi MP 286 is a neat little machine with modest aspirations that it fulfills quite nicely. There are two disk drive bays for half-height devices: one floppy and one hard disk or two floppies. You also get six slots and a motherboard that comes with a parallel and serial port, a floppy disk drive controller, and 512K bytes of RAM. Easily accessible DIP switches are one of the system's nicest features.

MITSUBISHI ELECTRONICS AMERICA INC.

Mitsubishi MP 286

Cute is a word to be used sparingly, but it certainly fits here. While some manufacturers have pursued the goal of the ultimate power machine with unlimited potential, Mitsubishi Electronics America has quietly created a modest machine with simple aspirations.

One look at the diminutive (15- by 15-inch) case tells the whole story; there is something quite different going on here. There are only two disk drive bays for half-height devices; you get one floppy and one hard disk drive or two floppy disk drives, and that's all. Inside you find six slots: two 8-bit and four 16-bit. There is a parallel port and a serial port on the motherboard, which lead to D-connectors mounted on the back of the case. The floppy disk drive controller is also included in the motherboard circuitry.

You may have a hard time finding the motherboard, since the only thing showing on the left half of the machine is a backplane for the expansion slots. The motherboard itself runs beneath the disk drives and the 135-watt power supply. There is only 512K bytes on the motherboard; expansion memory is mounted on a small proprietary card just to the left of the disk drive bays.

ACCESSIBLE SWITCHES On the outside of the case, there is a small sliding hatch next to the power and disk drive access indicator lights. Open this hatch to reveal one of the nicest pieces of design going. Inside are two small DIP switch sets that control the configuration of many system features. These are the same switches that are buried under disk drive cables on some computers or scattered all over the place as hard-to-locate jumper pins. Mitsubishi deserves special credit for making access to these switches so easy. To top it off, there is a small reset button in there as well. It requires a small pointed object such as a pen to trigger it, so inadvertent resets should be all but impossible.

The 101-key Key Tronic keyboard has a fairly good feel, although the "over-center" resistance felt a little uneven to my touch. I was able to adapt to it easily, however, and would judge it to be above average for the group of machines tested here.

The computer comes with an Installation Guide and a DOS manual. (BASIC comes with the computer, but the BASIC manual is an extra-cost option.) The manuals are well designed and thorough and are clearly aimed at the novice user. There are plenty of illustrations in the Installation Guide, and all switch settings are carefully explained.

Some of the features are not as kind to beginners, however. For example, in order

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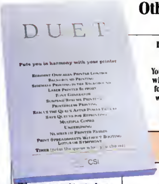
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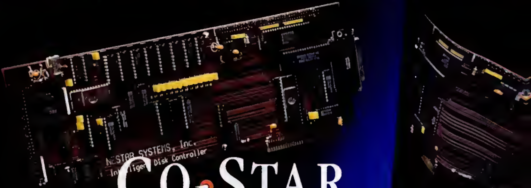

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to change the CMOS RAM configuration data, you must run the diagnostics program. It would seem that it would be possible to access the data through a separate program just as easily. Another small point is that the CPU speed can be selected only through the front-panel DIP switches. A program or combination keystroke would be more convenient in some circumstances.

The CPU runs at a top speed of only 8 MHz, so the MP 286 was the slowest computer tested in this group. It does come with a fast hard disk, however, and that will take the edge off the slower performance in many applications.

Much of this may evoke a sense of déjà vu for some readers, with good cause. The MP 286 is a close relative of the Sperry PC/microIT reviewed in "Competing at the Top: High-Performance ATs" (*PC Magazine*, Volume 6 Number 2), which earned an Editor's Choice for its compact design. The Sperry had its expansion cards mounted sideways, and the case was about an inch shorter than the MP 286, but other than that the PC/microIT and the MP 286 are very similar. This is due in large part to the fact that Mitsubishi builds the PC/microIT for Sperry (now Unisys).

> ■ The Mitsubishi MP 286 is a solidly built, compact unit and may well have the best design for the workstation of the near future.

FACT FILE

Mitsubishi MP 286
Mitsubishi Electronics America Inc.
991 Knox St
Torrance, CA 90502
(800) 556-1234 ext. 25
(800) 441-2345 ext. 25 (in Calif.)
List Price: With 640K RAM, two 1.2-Mbyte floppy disk drives, clock/calendar, DOS, and BASIC, one parallel and one serial port, $2,495; with monochrome monitor $2,745; with EGA monitor $3,395; with 20-Mbyte hard disk drive, $2,995; with 40-Mbyte hard disk drive, $3,445; with monochrome monitor and 20-Mbyte hard disk drive, $3,395; with monochrome monitor and 40-Mbyte hard disk drive, $3,845; with EGA monitor and 20-Mbyte hard disk drive, $4,045; with EGA monitor and 40-Mbyte hard disk drive, $4,495.
In Short: This compact AT clone packs a lot of power into a small package. The CPU runs only at a top speed of 8 MHz, and the price is a bit steep to make it an attractive value, but it is well built and represents an excellent design for a desktop workstation that meets the needs of the average user.

CIRCLE **695** ON READER SERVICE CARD

If anything, the MP 286 is an improvement over the PC/microIT, since it makes it easier to install expansion cards. The added height is not significant. At a retail price of $4,495, for the configured system, the MP 286 is not going to attract many bargain hunters, but it is a solidly built, compact unit and may well have the best design for the workstation of the near future, as described in this article's introduction. If everyone will need a computer, and not everyone will need a 386-based machine, then the compact and powerful Mitsubishi MP 286 may have the type of design to which many people will turn.

PC DESIGNS INC.

PC Designs GV-286

The Japanese "bullet trains" have a glamorous, worldwide reputation for speed, yet relatively few people are aware of La Train à Grande Vitesse, France's competing version of high-speed rail travel. It is only fitting that PC Designs should choose the French train as its namesake when building an old-world 286 technology machine that rivals the best that the new 80386 world has to offer.

The PC Designs GV-286 is not content with competing with other AT-style computers. Running at 12 MHz with zero wait states, it begs comparison with the newer 386-based machines. It is just a shade slower than the Compaq Deskpro 386, and it runs almost twice as fast as an 8-MHz IBM PC AT.

PC Designs designed the system from scratch, building in some innovative elements for faster speed. The motherboard includes 1 megabyte of 100-nanosecond RAM as a standard feature. There is an additional 32K bytes of 45-nanosecond static RAM that serves as a dedicated cache for memory address space. (This feature can be toggled on and off from the keyboard, although there is no indication whether your keystrokes have turned it on or off.) To avoid some of the expansion card compatibility problems encountered by other souped-up 286 machines, the GV-286 uses the standard (yet slower) 8-MHz clock speed for the expansion bus slots. As a result, performance will slow to merely fast for expansion cards.

The benchmark-test results for this machine bear out the benefits of its built-for-speed design. It was the undisputed speed champ among the units tested here, and many of its times approached those of the Compaq Deskpro 386. For example, its floating-point times were only 9 percent slower than the Compaq, and its CPU instruction set times were barely more than 6 percent slower than the Deskpro 386. In contrast, many of its times were far better than the AT compatibles from American Research Corp. and Standard Brand Products tested here, which also operate in the 12-MHz range.

EDITOR'S CHOICE

FACT FILE

PC Designs GV-286
PC Designs Inc.
2500 N. Hemlock Circle
Broken Arrow, OK 74012
(918) 252-5550
List Price: With 1 Mbyte RAM, two 1.2-Mbyte floppy disk drives, *DESQview* software, one parallel and one serial port, $2,435; with monochrome monitor and 20-Mbyte hard disk drive, $3,199.
In Short: Beneath its plain exterior lurks a blazing-fast machine that compares favorably with 386-based computers. A low price is coupled with innovative design, yielding a remarkable value.

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Physically, the GV-286 does not look particularly different from the IBM PC

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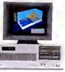
A large number of options and accessories are available for the AMT-386 and AMT-386 TURBO, including floppy disks, hard disks, memory boards, and peripherals.

AMT-286 TURBO™★★★★



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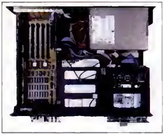


The PC Designs GV-286 is the undisputed speed champ among the systems tested here. A motherboard with 1 megabyte of 100-nanosecond RAM and an additional 32K bytes of 45-nanosecond static RAM that serves as a dedicated cache for memory address space were built in to help achieve its high speed. Five half-height disk drive bays, a front-panel reset button, and intelligent software also distinguish this innovative system.

AT. The full-size case has five half-height disk drive bays, but all three right-hand bays are open to user access. This means you can have two floppy disk drives and a tape drive all mounted in the machine, without resorting to an external housing.

EASY SETUP The case also sports a front-panel reset button. In the back, there are cutouts for five port connectors: two 9-pin and three 25-pin. On the evaluation unit, a serial port from the I/O card was cabled to a 25-pin connector in one of the cutouts. All the ports, including those on the expansion cards, had labels on the back panel indicating their assignments. Extra touches such as these make system setup considerably easier.

The GV-286 comes with software that also makes installation easy. The setup utility exhibits excellent intelligence; it does its best to figure out on its own what the system configuration is and asks you for information only on the items it can't answer on its own (such as the current time and date). This should be a definite plus for novice users or busy support staff.

The Priam hard disk came with self-installing software. The instructions explained how to create a working copy of the install disk, and it turned out that it was essential to follow the steps carefully. Once started, however, the software took over, modifying the disk and rebooting the computer more than once. In the end, the hard disk had DOS installed, and it was possible to boot from the hard disk without further installation.

While configuring the hard disk, I got an error message that said the hard disk was improperly installed. I ran through the usual steps: check switches, prod cables, and generally look around. Then I turned to the manual and was pleased to discover a toll-free telephone support line. The call was answered immediately by a knowledgeable person who went step by step through the process with me and confirmed that I had done everything correctly up to that point. He had such confidence in PC Designs' quality-control procedures that he was certain that the disk was in working condition and that some cable or component had simply worked loose. He told me to remove the disk entirely and reinstall it. I was skeptical but agreed to try, fully expecting to have to call back when that failed. Son of a gun! It worked fine. It is foolish to base an assessment of technical support on a single call, but PC Designs gets high marks here for its potential.

PC Designs has accomplished some other small details with flair. Has your AT battery ever given out? (The IBM PC AT batteries are now beginning to drop like flies as they reach the end of their 2-to-3-year life span.) Ever try to find one on a Saturday? The unique lithium batteries are not standard hardware store items. PC Designs avoids the entire problem by using a bank of standard alkaline penlight batteries. Granted, they may not last as long, but they are far less expensive and much easier to find locally.

This solid design and construction are available for the surprisingly low cost of $2,435, and the fully configured evaluation unit was $3,199 (which includes a 28-millisecond 20-megabyte hard disk). The price would be fair for an AT compatible, but it's a bargain when compared with the prices of the 386-based machines that per-

■ Running at 12 MHz with zero wait states, the PC Designs GV-286 begs comparison with the newer 386-based machines.

form only slightly better and cost up to twice as much. Perhaps the "GV" should stand for "great value."

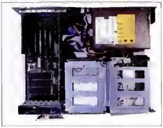
STANDARD BRAND PRODUCTS

Standard 286/12

Not many years ago, people gladly spent $3,000 on an Apple II computer. Computer capabilities have risen and prices have fallen to the point where you can now purchase a fast AT-compatible machine for half that price. The Standard 286/12, from Standard Brand Products, is one of the leaders in giving the buyer a bargain-priced powerhouse.

From the outside, the 286/12 looks like any other typical AT-type computer, with its power switch mounted on the side, wide and tall case, lock on the front, and openings to two half-height disk drive bays. According to a Standard Brand representative, the 286/12 comes with a new AT-style 101-key keyboard, but the evaluation unit we received came with the old AT-style keyboard.

Inside, the computer looks familiar as well. It has the typical eight slots, two for 8-bit cards and six for 16-bit cards. One of the latter was filled with a Western Digital floppy/hard disk drive controller and was attached to two floppy disk drives and one hard disk drive. Both floppy disk drives were made by Panasonic: one 1.2-Mbyte floppy and an optional 360K-byte floppy. A hard disk is another option, and the evaluation unit came with a 43-megabyte Miniscribe model.



The Standard 286/12 is a bargain-priced, high-powered machine. For a base price of $1,495 you get a typical AT-type computer with eight slots, openings to two half-height disk drive bays, a stack of free software, and a motherboard fitted with RAM chips set in sockets with an extra two sets of pins. This permits the use of 1-megabit chips to add up to 4 megabytes of RAM on the motherboard.

PC MAGAZINE FACT FILE

Standard 286/12
Standard Brand Products
12303-G Technology Blvd.
Austin, TX 78727
(800) 531-5475
(512) 250-5441 (in Tex.)

List Price: With 1 Mbyte RAM, two 1.2-Mbyte floppy disk drives, clock/calendar, two parallel and three serial ports with one cable, $1,495; monochrome monitor, $159; EGA monitor, $579; 42-Mbyte hard disk drive, $585; 360K-byte floppy disk drive, $109.

In Short: The Standard 286/12 gives high performance for low cost, but the thin documentation and design quirks make it best suited for the experienced and adventurous.

CIRCLE **693** ON READER SERVICE CARD

The evaluation machine also included an optional monochrome/graphics combination of an adapter card (residing in one of the 8-bit slots) and one of the new, flat-screen-technology monochrome monitors from Samsung. The image was sharp and easy on the eyes.

Some of the 286/12's features are less familiar. To begin with, the additional clock speed is achieved through the use of a little daughterboard mounted on top of the motherboard near the CPU chip. This may help keep costs down since it uses the same motherboard as slower machines, but I would prefer a system designed from the ground up to run at 12 MHz rather than a kludged modification.

The RAM chips on the motherboard are set in sockets that have an extra two sets of pins. According to the documentation, this is to permit the use of 1-megabit chips to put up to 4 megabytes of RAM on the motherboard, but you must return the computer to Standard Brand for a factory modification in order to take advantage of this feature.

There are other little quirks and problems with the machine. Five cutouts located in the back of the case—three big enough for 25-pin connectors and the others for 9-pin connectors—can be used to mount connectors for the three serial ports and two parallel ports, but only one of each comes with a cable and connector in the base price model. In the evaluation unit, Standard Brand neatly attached a label that marked the parallel port as LPT1:, but the monitor adapter card's parallel port had that designation. Experimentation revealed that the motherboard port was configured for LPT2:. The motherboard also has a reset button in the back, but inexplicably there is no opening to get at it.

FREE SOFTWARE The computer did come with a stack of free software. The hard disk came installed with FullBack, a backup utility from Westlake Data, and Disk Manager, a partitioning and formatting utility from Ontrack. The monochrome/graphics adapter came with its own utility software.

The configuration utility was a little cumbersome to use; the only way to get at it was to turn the machine off and then on again. I missed the ROM-based "hot key" access to configuration utilities offered by many compatibles these days.

The 286/12 performed well, scoring about 1.5 times faster than an IBM PC AT running at 8 MHz. The 43-megabyte Miniscribe was acceptably fast at 33 milliseconds, but it was one of the slowest drives tested in the group.

The documentation is thin, but it does an excellent job of providing information on memory maps, port addresses, and more. The manual does try to help the novice user set up and operate the system, and there are a number of illustrations provided with the text. Unfortunately, some of the tasks are complex, such as disconnecting the battery backup for at least 5 minutes in order to reset the CMOS RAM configuration or adding jumpers to configure the I/O ports on the motherboard. Experienced users should not have trouble with these instructions, but beginners may find them daunting.

The $1,495 price is attractive, but keep in mind that the final cost of the test unit was $2,348, not including DOS. The Standard 286/12 is best suited for users who are able to fend for themselves (or have strong support close by) and for whom low price is an overwhelming priority in their purchase decision.

WANG LABORATORIES INC.

Wang 280

Too many people remember the Wang PC. That's too bad, because it means some of them may not find out how different the newest Wang entry into desktop computing, the Wang 280, is from past efforts.

When Wang Laboratories first decided to market a desktop PC, it placed high priority on supporting Wang systems and products. The keyboard was optimized for Wang word processing and the Wang software interface. The computer was designed to work well as a terminal on Wang VS minis and related systems. In response to user demand, Wang also built in IBM PC compatibility, sort of.

With add-on cards and multiple boot procedures, most IBM-compatible software would run pretty well, if the keyboard didn't get in the way.

All those problems are a thing of the past. Wang has not lost sight of its original goal, and the keyboard still supports the Wang software interface. But Wang has given equal weight to two other goals: recognition of accepted PC standards as they exist in the marketplace, and achieving a design that coexists with other vendors for a variety of expansion and interconnection products.

While you can learn about these goals from talking to Wang representatives, the most eloquent spokesperson is the Wang 280 itself. It runs MS-DOS straight out of the box, the motherboard looks similar to any of a dozen competitors, and the familiar Phoenix ROM BIOS copyright notice appears on the screen when you power-up. Our evaluation unit came with a Panasonic 1.2-Mbyte floppy disk drive and a 34-megabyte Micropolis hard disk drive, both running off the ubiquitous Western Digital combination hard/floppy disk drive controller. There are eight full-length slots, two of which are 8-bit slots and the remaining six 16-bit. A beefy 229-watt power supply provides the juice.

The motherboard is built around the Chips and Technologies AT CHIPSET and has built-in parallel and serial ports (one of each) that are attached to D-connectors mounted on the back panel of the case.

The case itself is fairly typical. About the same size as the standard IBM PC AT case, it provides room for five half-height devices. Unlike the IBM original, all three bays on the right can be opened to give you access from the outside. This means that you can install two floppy disk drives and still have an opening for a tape drive without resorting to an external enclosure.

Another unusual feature about the front panel is the mysterious lozenge-shaped button that protrudes from the center. Careful inspection reveals a small symbol printed in relief just below: a circle with a vertical bar inside it. Those familiar with international symbol language might recognize this as a combination of the "on" and "off" symbols, but the rest of us will have to rely on the Wang manual to enlighten us to the fact that this is the power switch. It is convenient to have it up front, but a rocker switch or better labeling would help make its purpose more clear.

THOROUGH MANUAL The Wang 280 comes with enough documentation to strain the back of your UPS delivery per-

PC MAGAZINE FACT FILE

Wang 280
Wang Laboratories Inc.
One Industrial Ave.
Lowell, MA 01851
(800) TEL-WANG
(617) 459-5000 (in Mass.)

List Price: Model 280-3 with 640K RAM, two 1.2-Mbyte floppy disk drives, clock/calendar, DOS, one parallel and one serial port, $3,850; monochrome monitor, $250; EGA monitor, $950; 20-Mbyte hard disk drive, $630; 34-Mbyte hard disk drive, $1,195; 42-Mbyte hard disk drive, $1,395; 60-Mbyte hard disk drive, $2,395; 1.2-Mbyte floppy disk drive, $265; 720K-byte, 3½-inch floppy disk drive, $170; 360K-byte floppy disk drive, $215; 512K-byte, 16-bit RAM expansion card, $450; 512K-byte expansion modules, $295 each; 80287 coprocessor, $375.

In Short: The Wang 280 is expensive, but it combines a lot in one case. It maintains traditional Wang features, such as support for Wang word processing and VS mini connections, while entering the mainstream of PC compatibility through the use of standard components such as the Phoenix ROM BIOS.

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PC 10/12

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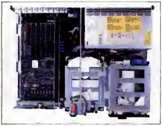


Wang's latest entry into the PC market, the Wang 280, runs MS-DOS straight from the box and comes with eight full-length slots and a motherboard with built-in parallel and serial ports. The keyboard, while supporting the Wang interface, also functions well with PC software. The first ten function keys behave exactly like a PC's, and the more-exotic keycaps have IBM keyboard equivalents printed in blue across the front.

son. In addition to a thorough manual covering the installation of the hardware (including some pieces that are not included with all models), you also get a user's guide, a Troubleshooting Guide, and manuals covering DOS, BASIC, and *Microsoft Windows*.

There are many optional programs available, including the old standard, the Wang word processor. True to form, the Wang 280 keyboard sports such curious keycaps as Cancel, Exec, Help, Erase/D Tab, and the mysterious GL. (The GL key is dedicated to Wang word processing glossaries, which are a form of a macro.) There are also 16 function keys arranged along the top of the keyboard.

The good news is that the keyboard functions extremely well with PC software. The first ten function keys behave precisely as a PC's do, even when they are combined with Alt, Ctrl, or Shift. Some of the exotic keycaps, such as Exec, also have IBM keyboard equivalents printed across the front in blue letters (End, in this case). As with the new AT-style keyboard, there are separate cursor and numeric keypad areas, and almost all PC keys appear at least once with their normal labels and in fairly familiar positions.

One exception is the Alt key. The keycap reads 2ND, and sits to the right of the Spacebar, with Ctrl to the left of the bar. These two keys have convex surfaces, which is unusual for a PC keyboard. This arrangement also makes it difficult to issue the "three-finger salute"; Ctrl-Alt-Del requires almost an octave stretch.

Running at 10 MHz, the Wang 280 will not set any records, yet it has a more than adequate response for most applications. The most important point is that Wang has taken an almost off-the-rack solution to the compatibility problems of the past, while still maintaining the benefits that Wang users expect from a Wang PC. Since the vast majority of existing Wang PCs are connected to VS minicomputers, it makes sense for Wang to stick with the elements that have succeeded while working on the other problems.

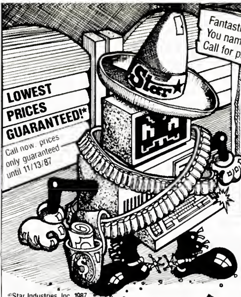
As the highest-priced machine reviewed in this group, it is unlikely that anyone will choose the Wang 280 in decisions in which cost is the main criterion, but Wang users will be happy to know that they can now have their cake and eat it too: strong Wang capabilities, along with market mainstream features and compatibility, in one box.

EDITOR'S CHOICE

• PC Designs GV-286

There are many attractive choices in this collection of machines, in part because each has taken its own path toward what its designers have pictured as the best 286-based machine. For rock-bottom price with power, the FiveStar FS-286 looks good, and the ARC Turbo 12's MIPS Meter is an enticing gadget, but the hands-down winner is the PC Designs GV-286. It coaxes extraordinary performance out of the 286 without going beyond 12 MHz through the use of imaginative design and careful engineering. The configured system price is one of the lowest tested, yet it was the top performer by a sizable margin.

Alfred Poor is a frequent contributor to PC Magazine.



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Perhaps the nicest surprise about the KAYPRO 286i/C is the suggested retail price of $2995.

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■ WORD PROCESSING ■ EDWARD MENDELSON

CLONKERS & COOLITUDE: *Spelling Checkers Get Better*

Mythical words, misspelled words. Spelling checkers used to stumble over the anomalies of English, and many in the current crop still do. But all 31 packages reviewed here can help you proofread, and some help you spell as you type.

A wise old newspaperman once told me that I had to learn only two rules to be a good writer: use long and short sentences alternately and spell the words right.

That newspaperman used to bang out copy on a manual typewriter, and his only spelling checker was in his head. Today, every journalist writes at a computer, and some let the machine check their spelling for them. Unfortunately, though computers are the best editing tools ever invented, they have a long way to go before they learn how to spell. Every spelling program represents a vain attempt to impose the clarity and logic of machine language on the disorder and ambiguities of human language. The struggle is often a rough one, but the language used by men and women invariably outsmarts that used by their computers.

DISCRETE KERNELS Spellers are the least exact, least reliable software ever devised. They're a lot better than nothing, but they can also be misleading and treacherous. While any spelling program can use brute force to detect typos and mistakes that a dozen human proofreaders would miss, no speller can find the words you typed in the wrong place or those you accidentally left out—and a missing *not* can mean a knotty contract. Nor has anyone devised a program that will correct you when your mistyped word also happens to be legitimate. Your computer simply doesn't know whether you're writing a scientific report about the *discrete kernels* in the *core* or whether you've simply made a few errors in your news story about the *discreet colonels* in the *corps*.

A few years ago, to check your spelling with a PC, you had to take files created with a text editor and run them through a separate spelling program. These days, you're more likely to use the speller that comes integrated (more or less) into your word processor. But standalone spelling programs, despite many predictions of doom, haven't dropped out of the market. Not every text editor includes a speller, and some of the spellers bundled with word processors are more trouble than they're worth. Also, desktop publishing programs often use files created somewhere else; a standalone speller can clear out errors before you go to press. And some of the newer standalone spellers have tricks your word processor may never have heard of. They can alert you to a spelling error as soon as you make it, something to be grateful for when you're writing electronic messages on-line or when you're facing a deadline and don't have time for a full-scale check.

For this survey, we tested 31 spelling checkers. Twenty-two were standalone packages. We also looked at a hardware speller that sits between your keyboard and computer. And we tested the spellers integrated, with varying success, into eight major word processing packages: *DisplayWrite 4*, *Manuscript*, *Microsoft Word* 4.0, *MultiMate Advantage II*, *PFS:Professional Write*, *WordPerfect* 4.2, *WordStar Professional* 4.0, and *XyWrite III Plus*.

These spelling packages came in two basic varieties. The traditional kind, and still generally the most useful, lets you review and correct a document after you've written it. The newer programs lurk in your computer's memory, checking your spelling as you work and beeping when you type a word they don't recognize. Alternatively, you can press a "hot key" and these RAM-resident programs will tell you if you've misspelled the word marked by the cursor or all the words on-screen. These spellers use the same basic technology as do resident thesauri; the two programs often come on the same disk.

The beeping programs are certainly intriguing toys, and a lot of them get sold. Not as many get used. If you like to type fast, concentrate on your writing, and repair the misspelled words later, the incessant beeps can drive you to distraction. The document checkers are rarely glamorous, but they get the job done.

Whether a program traps an error as you make it or reports it weeks later, it should also tell you how to correct it. Most of the older spellers, and far too many of the new ones, make you press a key and wait before they suggest corrections. The best of the newer programs don't wait to be asked; they immediately offer a list of alternatives and let you insert the right one into your file with a single keypress. An even more helpful feature is *XyWrite*'s optional "auto-replace," which can correct mistakes you didn't even know you made. If, for example, you repeatedly type *taht* when you mean *that*, you can set the speller to substitute the correction as you type, either silently or to the accompaniment of any beep you choose.

■ Whether a program traps an error as you make it or reports it weeks later, it should also tell you how to correct it.

The first microcomputer spelling programs, back in the days of CP/M, were primitive affairs with dictionaries of only a few thousand words. And, since those words were input by hand, they were often spelled incorrectly. One overconfident author offered $25 to anyone who found a misspelling in his program; of all the mistakes he made while working on the package, that proved by far the costliest.

Things changed in 1981, when a newspaper editor named Dick Brass formed a company called Dictronics Publishing and brought out the first professional spelling program, *The Random House ProofReader*. Brass had bought the electronic rights to the *Random House Dictionary: Concise Edition*, so he got an accurate word list that didn't need retyping. In 1983 Wang bought the company, and licensed versions of the original program continue to appear under various slick disguises. You can also still buy it under its original name.

The first speller integrated with a word processing program was MicroPro International Corp.'s *SpellStar*, a *WordStar* add-in. MicroPro claimed that its dictionary had 20,000 words in its 97K-byte file, although few of them seemed to match the words in anyone's document. *SpellStar* was fast and ugly: it displayed all the doubtful words in an unreadable mass of capital letters, it littered the text with "^@" flags, and it didn't even try to offer alternatives to misspelled words. *SpellStar* soon begat *CorrectStar*, which had a better dictionary but was just as ugly.

DOORLY COOLITUDE The spelling programs of 1987 perform feats no one dreamed of in 1981. Now that computers come with plenty of memory, the fastest programs keep their word lists in RAM, and new compression techniques can squeeze 100,000-word dictionaries into amazingly small files.

But the road to today's sophistication hasn't been smooth. A few years ago, some companies tried to compress their dictionaries by combining a simple list of word stems with simple lists of prefixes and suffixes. The resulting packages often couldn't tell real words from mythical monsters like *coolitude* or *doorly*. Today's best programs can identify which appendages go with individual stems to create real English words.

Word lists that derive from published dictionaries tend to be highly accurate, but accuracy alone doesn't make them ideal for spelling programs. Most printed dictionaries include variant spellings, like *reveling* and *revelling*, since well-educated Americans use either form.

Yet one legitimate use of a spelling checker is to help achieve consistency of style, often a crucial point for publishers and editors. If you don't want *licence* in one paragraph and *license* in the next, it helps to have a spelling program that will accept one and flag the other.

Electronic dictionaries have other problems. Far too many don't know which side of the Atlantic they're on; they accept British forms like *favour* and *cheque* without raising an eyebrow. Also, many spellers accept common forms that you may want to avoid in more dignified prose. Dictionaries and spelling programs often include *alright*, but purists don't care for it. A speller should give you the chance to change it into something that unquestionably looks *all right*.

Most business letters and memos use a vocabulary of only a few hundred words. Anyone in a specialized profession, however, works with an enormous vocabulary largely unknown to the rest of us. If a spelling program tried to include every possible legal, medical, and scientific term, the waste of time and disk space would outweigh the benefits. The ideal balance is a program that has a large but not exhaustive vocabulary and that lets you add your own words to its dictionary. Some programs, like *WordStar*, offer specialized word lists for law, medicine, and the financial industry as well.

If you write letters overseas, you can now find programs that check your spelling in any of a dozen languages. Don't expect to buy them from international corporations, however. IBM will sell you *DisplayWrite* in many foreign languages, but only in the countries where the language is spoken, and you can't buy the foreign-language spelling dictionaries alone. In contrast, WordPerfect Corp., with its usual *savoir faire* and *Gemütlichkeit*, will gladly sell you dictionary disks in any of a dozen languages or in British English.

UNDERSKIRTS AND CLONKERS

Different spellers seem to have different theories about their users. *WordPerfect* and *XyWrite* give you credit for knowing approximately what the misspelled word looks like; they offer alternatives fairly close to what you had in mind. (*WordPerfect* also provides a unique phonetic lookup function if you really don't know what the word looks like.) *WordStar*, on the other hand, seems to assume that you're making a desperate guess about a word's spelling based on its sound. If you type *indiscrete*, this program suggests that perhaps you meant *underskirt*.

Quite a few dictionaries seem to be packed with words no one but a lexicographer ever dreamed of. I tried looking up *selfness*, a word I thought didn't exist. When it turned up in a couple of dictionaries, I learned that it was an archaic word meaning *selfishness*. Several programs, confronted with *tonite*, offered *tenuit* as a possible replacement, though not even the great *Oxford English Dictionary* has ever heard of the word. (I suspect it's simply a mistake that keeps getting copied from one program to another.) And I'm still trying to figure out *clonkers*, which turned up in *Webster's New World Spelling Checker* but isn't in the printed dictionary the program uses as its source.

Though most spelling programs claim an impressive number of words, it's not always clear just what those numbers mean. The same dictionary, coded differently, seems to be used in IBM's *DisplayWrite 4* and *Word Proof II*, but the first boasts 100,000-plus words while the second claims 125,000. Few publishers want to say how they arrive at their figures—whether *word* and *words*, for example, would count as one entry or as two. The publicity for *PC/Spell* makes the brashest claim of all: the publisher maintains that the program's algorithms give it "a vocabulary of over 34 MILLION words!" As the English language boasts some 600,000 words at most, this may be a few million more than you need.

Our test script included two ASCII files, LONG.DOC and SHORT.DOC. The first, a 64K-byte file of about 10,000 words, had a vocabulary limited to about 600 words, so the spellers could run through it without stopping. (We had to revise the file and start over when *DisplayWrite* stumbled over *obsessed*.) We used this test as a rough measure of the speed at which a program scans long documents. Raw speed is not an adequate measure in itself, however: some programs are quick at scanning a file but slow at looking up individual words. A program with a large dictionary might require more time to look up a word than will a program with a smaller list—but it will also stop less frequently to make you confirm legitimate words.

In measuring the speed of standalone programs, we started the clock when we entered the program name at the DOS command line, using the document name as a parameter whenever possible (as in "SPELL LONG.DOC"). For the integrated word processing packages, we called LONG.DOC to the screen and started the clock when we invoked the built-in speller, a procedure that gave these programs a few seconds' advantage. Our test bench was an IBM PC equipped with a 20-megabyte hard disk that had an average access time of about 44 milliseconds. An accelerator board made this computer run at about 2.2 times the speed of a standard 8088 machine; AT-class machines are about 50 percent faster still. Adjust your interpretation of our figures accordingly.

Our other test file, SHORT.DOC, consisted mostly of common misspellings, simple typing mistakes, and rare words spelled correctly. We wanted to see if the spellers offered the right alternatives (if any) for the mistyped words and if their word lists were large enough to handle the vocabularies of various specialized fields. The typing errors in SHORT.DOC are all real-world mistakes—some of them my own, the rest culled from on-line services and bulletin boards. Some may be puzzling: *spagnum* is supposed to be *sphagnum*, while *taht* is my standard mistyping of *that*. In the specialized vocabulary, a *replevin* is a writ, a *nematode* is a worm, and a *boson* is a subatomic particle (quite a bit smaller than a *bison*, the alternative word that some programs thought I had in mind).

We also wanted to see how the spellers handled misplaced apostrophes, as in *do'nt*. Some had a very hard time getting the correct form of this word back into the file. Most passed over the erroneous form *our's*. Very few flagged the incorrect form *its'*, although this may be an unreasonable expectation, since any program that caught this mistake would probably flag every word that preceded a single quotation mark. We checked to see whether the spellers recognized misplaced or missing capitals or whether they ignored capitals entirely, and we misspelled *DiMaggio* to see whether the programs could handle capital letters in the middle of words.

Other words were included to test whether the programs flagged British spellings and whether they accepted real but uncommon words, like *caste* and *fro*, that were more likely to be the results of mistypings than the correct words. We included some archaic and variant forms, to see what kind of vocabularies different programs expected to encounter. And, in another part of our test, we found that very few spellers handle foreign characters. Most consider any non-ASCII character a word separator, flagging *façade*, for example, as the two nonwords, *fa* and *ade*.

IT IS, IS IT? Our script tested the ability of each speller to accept hyphenated words and reject false compounds. We also checked whether the programs could correct the same word more than once without correction and confirmation every time. Many spellers test for repeated words (as in in this sentence); the ones that test intelligently won't flag identical words separated by punctuation, as in "It is, is it?"

The results of our survey are summarized in the following reviews and are divided into spelling checkers included in word processors and standalone packages. Within each category, the reviews are arranged in alphabetical order by product. And, though many of these packages turned out to be excellent programs, our tests made one thing abundantly clear: the kind of dictionary that is printed on paper contains far more information about the English language than does any computer program ever written.

Spelling Checkers Integrated into Word Processors

DisplayWrite 4

IBM Corp.'s *DisplayWrite 4* spells the way it does everything else—slowly but effectively. Unfortunately, its disk-based dictionary (apparently the same as in *Word Proof II*, though encoded differently) isn't the most extensive or up-to-date: it didn't recognize any of the specialized vocabulary or foreign words (except *samurai*), and it suggested *decapitated* as the correct spelling of *decaffinated*. However, it was one of the few that offered *magazine* as the correct form of *mazagnie*.

IBM lets you start checking an entire document from the opening menu or from inside the file. From the menu, you can choose either a "prompted" spelling check or an "automatic" one. In a prompted check, the program stops at every word it doesn't like and asks you to accept or revise that word. If you want an alternative spelling, *DisplayWrite 4* lets you drum your fingers on the desk while you wait for it to suggest one. An automatic check grinds through the whole file without stopping, then displays the text with all the doubtful words temporarily highlighted.

PC FACT FILE

***DisplayWrite 4*, Version 1.0**
IBM Corp.
Old Orchard Rd.
Armonk, NY 10504
(800) 447-4700
List Price: $495
Requires: 310K RAM (341K using floppy disks), two disk drives, DOS 2.1 or later.
In Short: Big Blue's idea of an integrated speller is an odd mix of cleverness and clumsiness; a program only IBM could love. Not copy protected.
CIRCLE 610 ON READER SERVICE CARD

If you choose to work from within the file, the kind of check you get depends on the defaults you've chosen. You can also select an individual page (always an automatic check) or a single word. When you're through, *DisplayWrite 4* asks if you want to add words you accepted into the user dictionary; other programs, more sensibly, let you do this on the fly.

Though *DisplayWrite 4*'s speller has a number of useful features, overall it's a bit too clumsy for a warm recommendation. This is a program only IBM could love.

Manuscript

Lotus Development Corp.'s scientific and technical "document processor" boasts some state-of-the-art-features, but its speller isn't one of them. The program's word searches are interminable, and you'll probably decide not to bother asking for its suggestions—the Lotus package has some odd notions about the best way to correct your work.

Manuscript lets you check a document's spelling either from the main menu or from the editing screen. (If you choose the latter route, you have to get to the speller via the Print menu.) The spelling program won't let you check one word or a selected part of a file, although it will let you

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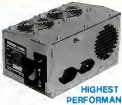

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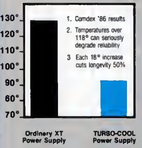
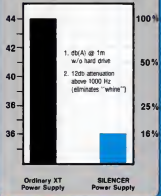


NOISE LEVELS



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(619) 723-9513

Spelling Checkers: Summary of Features

(Products listed in ascending price order)

	List price	No. of words in dictionary	Personal dictionaries	Special dictionaries	Thesaurus	Checking style	OPERATION Checks multiple files (batch mode)	Checks defined area	Ignores text	Undoes previous correction	FEATURES Offers alternative spellings automatically	Word counting
STANDALONE SPELLING CHECKERS												
LSpell	Free	130,000	●	○	○	Whole document†	○	○	○	○	○	●
G-Spell	$9.95	90,000	●	○	○	Whole document	○	○	○	○	○	●
Paperback Speller	$39.95	60,000	●	○	○	Whole document	○	○	○	●	●	●
Word Proof II	$39.95	125,000	●	○	●	Whole document	○	○	○	○	○	○
PC/Spell	$49.00	24,000	○	○	○	Whole document	○	○	○	○	○	○
Professional Spelling Checker	$49.00	45,000	○	○	○	Whole document	●	○	○	○	○	●
Strike	$49.95	49,000	●	○	○	On-screen	○	●	○	○	○	○
Whoops!	$49.95	50,000	●	○	●	On-screen/ as you type/ whole document	○	○	○	○	○	○
The Random House ProofReader	$50.00	80,000	●	○	○	Whole document	○	○	○	○	○	●
Webster's New World Spelling Checker	$59.95	110,000	●	○	○	Whole document	○	○	○	○	●	●
PC **MicroSpell**	$69.95	80,000	●	○	○	Whole document	○	○	●	●	●	●
V-Spell	$79.00	70,000	●	○	○	Whole document	○	○	○	○	○	●
Spellin!	$79.95	90,000	●	●	○	On-screen/ whole document‡	○	●	○	○	○	○
Windows Spell	$79.95	65,000	●	○	○	On-screen/ whole document§	○	○	○	○	○	○
Reference Set	$89.00	83,000	●	●	●	On-screen/ whole document	○	○	○	○	● (resident) ○ (standalone)	●
Webster's Electronic Thesaurus	$89.95	40,000	○	○	●	On-screen	○	○	○	○	●	○
Spellix	$95.00	66,000	●	○	○	Whole document	○	○	○	○	○	●
PC **Turbo Lightning**	$99.95	130,000	●	○	●	On-screen/ as you type	○	○	○	○	●	○
Jet:Spell	$109.95	130,000	●	●	○	Whole document	○	○	○	○	○	●
Electric Webster	$129.95	50,000	●	○	○	Whole document	○	○	○	○	○	●
The Word Plus	$150.00	35,000	●	○	○	Whole document	○	○	●	●	○	●¶
PC Type Right#	$199.95	100,000	●	○	○	As you type	○	○	○	○	○	○
Editor's Toolkit	$350.00	93,000	●	○	●	On-screen	○	○	○	○	●	●¶
SPELLING CHECKERS INTEGRATED INTO WORD PROCESSORS												
PFS: Professional Write	$199.00	77,000	●	○	●	On-screen/ whole document	○	○	○	○	○	●
PC **XyWrite III Plus**	$445.00	100,000	●	●	●	On-screen/ as you type/ whole document	●	●	○	○	●	●
Microsoft Word	$450.00	130,000	●	●	●	On-screen/ whole document	○	●	○	●	○	●
DisplayWrite 4	$495.00	100,000	●	○	○	On-screen/ whole document	○	○	●	○	○	○
Manuscript	$495.00	90,000	●	○	○	On-screen/ whole document	○	○	○	○	○	○
PC **WordPerfect**	$495.00	115,000	●	●	●	On-screen/ whole document	○	●	○	○	●	●
WordStar Professional	$495.00	87,000	●	●	●	On-screen/ whole document	○	○	○	○	●	●¶
MultiMate Advantage II	$565.00	110,000	●	●	●	On-screen/ whole document	○	●	○	○	○	●

PC—Indicates Editor's Choice ●—Yes ○—No N/A—Not applicable: The software does on-screen checking only; it does not check whole files. *The initials in this column correspond to the following word processors: *DW* = *DisplayWrite*, *MSW* = *Microsoft Word*, *WP* = *WordPerfect*, *WS* = *WordStar*, *XY* = *XyWrite*, O = Other. †Requires Borland's *Turbo Lightning*. ‡Requires Lotus's *1-2-3* or *Symphony*. §Under *Microsoft Windows*. ¶Through an included utility. #*PC Type Right* is a hardware device: it can only beep at words it doesn't recognize; it does not offer corrections.

										PERFORMANCE	COMPATIBILITY	
Hyphenation	Wildcard lookup	Phonetic lookup	Recognizes foreign characters	Preserves capitalization	Flags capitalization errors	Ignores words containing numbers	Recognizes hyphenated compounds	Flags repeated words	Can split two words typed as one	Checks 60K text file (min:sec)	ASCII	Word processors*
○	○	●	○	●	●	●	○	○	●	15:00	●	None
○	○	○	○	●	○	●	○	○	●	0:47	●	None
○	●	○	○	●	○	●	○	●	●	0:20	●	*WS*, O
○	○	○	○	●	●	○	○	○	●	0:60	●	None
○	○	○	○	○	○	○	○	○	○	2:35	●	*WS*
○	○	○	○	○	○	○	○	○	●	3:10	●	None
○	○	○	○	●	○	●	○	○	○	N/A	●	*DW*, *WP*, *WS*, O
●	○	○	○	●	○	●	○	○	●	0:50	●	*MSW*, *WS*, O
○	○	○	○	○	○	●	○	○	●	1:15	●	*WS*
○	○	○	○	●	○	●	●	●	●	1:00	●	*WS*, *XY*, O
○	●	○	●	●	●	●	○	●	●	0:29	●	*MSW*, *WP*, *WS*, *XY*, O
●	●	○	○	●	○	●	○	○	●	0:30	●	*MSW*, *WP*, *WS*, *XY*, O
○	○	○	●	●	●	○	●	●	●	4:50	○	O
○	○	○	●	●	○	○	●	○	●	1:35	●	*MSW*
●	○	○	●	●	●	○	●	○	●	0:46	●	*MSW*, *WP*, *WS*, O
○	○	○	○	●	○	○	●	○	●	N/A	●	*DW*, *MSW*, *WP*, *WS*, *XY*, O
○	○	○	●	●	○	●	○	○	●	1:55	○	None
○	○	●	○	●	●	●	○	○	●	N/A	●	*DW*, *MSW*, *WP*, *WS*, *XY*, O
○	○	○	●	●	●	●	●	○	●	3:53	●	None
●	○	○	○	●	○	●	○	○	●	1:25	●	*WS*
●"	●"	○	○	●	○	●	○	○	●	0:30	●	*WS*
○	○	○	○	○	●	○	○	●	○	N/A	●	*DW*, *MSW*, *WP*, *WS*, *XY*, O
○	○	○	●	●	●	○	○	○	●	N/A	●	*WP*, *XY*, O
○	○	○	●	●	●	○	●	●	●	3:30		
●	○	○	●	●	●	●	○	●	●	0:30		
●	○	○	●	●	●	●	●	●	●	2:10		
●	○	○	●	●	●	○	○	○	●	3:20		
○	○	○	●	●	●	○	●	○	●	3:20		
●	●	●	●	●	○	●	○	●	●	0:50		
○	○	○	●	●	○	○	●	○	●	3:05		
●	○	○	●	●	●	○	○	○	●	3:55		

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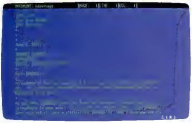

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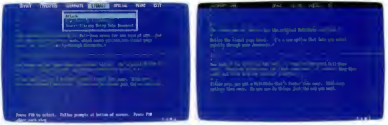

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CIRCLE 208 ON READER SERVICE CARD

FACT FILE

***Manuscript*,**
Version 1.0
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
(800) 345-1043
(617) 577-8500

List Price: $495

Requires: 512K RAM (640K RAM recommended), hard disk, DOS 2.0 or later, graphics adapter for print preview.

In Short: A sluggish speller in an ambitious but sluggish program. Not copy protected.

CIRCLE **604** ON READER SERVICE CARD

quit in the middle after making you start at the beginning.

The dictionary file comes from the same source that supplied the dictionary for *MultiMate*, but the two programs interpret their word lists in different ways. *MultiMate* thinks *develope* is a correct English word; *Manuscript* knows better. But that's not to say the Lotus program doesn't have its problems. Appropriately enough for a technical word processor, *Manuscript*'s best alternative for *spagnum* is *sputnik.* Other suggestions were often fanciful and sometimes startling. Is *harlot* really the best it can think of as a replacement for *alright*? Although *Manuscript* normally handles capital letters well, it got confused by *DiMaggio*, inserting the word into the file without the capital *m* and following it with a mysterious graphics symbol unmentioned in the manual. When it came across *jupiter*, *Manuscript* immediately suggested correcting with *Jupiter*, but when it reached *2nd*, it unexpectedly offered to change *nd* to *N.D*.

There are many reasons to purchase *Manuscript*. Just don't buy it for the speller.

Microsoft Word

The speller in Version 4.0 of *Microsoft Word*, which we tested in a beta version, is an improvement over earlier versions. You can now check a block or even a single word, as long as you're willing to sit patiently while the speller loads into memory, and you get three lines of context instead of only one. But *Word*'s spelling program still isn't fully integrated into the word processor.

For one thing, any changes and corrections you make from the speller's menus don't appear on-screen until you get back to your original file. You simply have to take it on faith that the words you alter or select are the ones you'll eventually get. Although the program flags repeated words, it can't remove them; instead, it lets you mark any unwanted pair with an asterisk or other character so you can locate it when the program returns you to the editing screen. When you split a word in two, it warns you that a space is an "invalid character," although the program will split the word anyway if you insist.

FACT FILE

***Microsoft Word*,**
Version 4.0
Microsoft Corp.
16011 NE 36th Way
Box 97017
Redmond, WA 98073
(206) 882-8080

List Price: $450

Requires: 256K RAM, two disk drives, DOS 2.0 or later.

In Short: The primitive speller is badly integrated into this sophisticated word processor. It can't even edit *Word*'s own files when they include foreign or technical characters. Too many beeps and prompts. Not copy protected.

CIRCLE **603** ON READER SERVICE CARD

Word lets you create separate supplementary dictionaries for individual documents or groups of documents, in the same way you can use separate style sheets. Microsoft also makes foreign-language dictionaries available, but you have to keep them in separate disks or directories. The manual says you can set up *Word* to display alternative spellings automatically, but the display doesn't work the way it does in *WordPerfect* or *XyWrite*: you still have to press the Correct option from the menu before you get to see any alternatives at all.

You may decide just to do without *Microsoft Word*'s automatic mode; even with it, the program's searches are slow enough to be annoying. As powerful as the rest of this package is, the speller simply isn't up to par with the competition.

MultiMate Advantage II

Don't rely on *MultiMate Advantage II* to maintain your company's reputation for literacy. This is the only program we tested that failed to detect the simple misspelling *develope*. Don't rely on it to let you get home in time for dinner, either. Everything about *MultiMate* is heavy and ungainly, from the padded box to the nine separate manuals to the interminable menus, ugly screen, and oversized template. The speller is no exception: it's faster than it was before, but it still grinds along at an excruciating pace.

MultiMate won't offer alternative spellings until you ask—and when you do, you may wish you hadn't. Sometimes I suspected that *MultiMate*'s lookup algorithm consisted of tossing the dictionary up in the air and offering whichever nine words happened to land first. When I asked the program to offer an alternative for *mazagnie* so that I could save the trouble of retyping it, *MultiMate* offered just about everything but *magazine—massaging*, *misogyny*, *emaciating*, and six others. For *rhytm*, it offered *litem*, *rotten*, and *rectum*, but no *rhythm*. It didn't like *mistyped*, suggesting that I replace it with *insteps* or *unstopped*.

MultiMate can repeat a correction

FACT FILE

***MultiMate Advantage II*, Version 1.0**
Ashton-Tate
20101 Hamilton Ave.
Torrance, CA 90502
(213) 329-8000

List Price: $565 (for full system for 5¼-inch disks); $595 for *MultiMate Advantage II Premium Package* (for full system for 5¼- and 3½-inch disks).

Requires: 384K RAM, two disk drives, DOS 2.0 or later.

In Short: A ponderous speller with an enormous vocabulary it doesn't know how to use. Sometimes illiterate. Elephantine and ugly. Not copy protected.

CIRCLE [illegible] ON READER SERVICE CARD throughout a file if you desire, and Ashton-Tate will let you buy dictionary disks in four foreign languages.

PFS:Professional Write

The original *PFS:Write* was a simple program that made it easy to write at a computer. The new *PFS:Professional Write* is more sophisticated but almost as easy. You won't gasp in admiration at its power, but you'll be grateful for its elegance and simplicity.

You can invoke the speller from a pull-down menu or a control key and check either the word or the whole document from the cursor forward. The speller makes up in video action what it lacks in features: it first opens a small window that displays the words being checked; next, when it flags a word, another window opens at some unpredictable place on-screen, asking you to choose a course of action by number or by moving a highlighted bar. If you want to type in a correction or to ask the program to look up alternatives, still another overlapping window opens. It's refreshingly simple to type in a small correction at any point in the operation. The replacement word rolls out gradually into your text rather than popping up instantaneously.

The program has a large vocabulary, although its search routines aren't state of the art. But it's one of the few that know that

PC MAGAZINE FACT FILE

***PFS:Professional Write*, Version 1.0**
Software Publishing Corp.
P.O. Box 7210
1901 Landings Dr.
Mountain View, CA 94039
(415) 962-8910

List Price: $199

Requires: 320K RAM, two disk drives, DOS 2.0 or later.

In Short: An unambitious but easy-to-use speller in a modest program; the vocabulary has odd gaps and inclusions. Not copy protected.

CIRCLE **545** ON READER SERVICE CARD

tonite ought to be *tonight*, and it offers that word first on its list of alternatives. More-sophisticated programs tend to offer *tontine*.

That's all there is to the *PFS:Professional Write* speller. And for most purposes, that's all you'll need.

WordPerfect

WordPerfect's speller is a beauty. It's quick, elegant, and completely integrated with the word processor, and it demands the fewest and most instinctive keystrokes of any design. You can make most of the necessary corrections in a long document simply by performing almost invisible movements with the fingers of one hand. It's almost an exercise in Zen and the art of spelling correction.

After you call up the speller, you can choose whether to check a word, the page, or the whole document; alternatively, you can type in a phonetic or partial spelling (wildcards accepted) and get a list of probable words. *WordPerfect* can also give you a word count of the whole document without a spelling check. If a block is defined, the program immediately checks it and counts its words.

Every time the speller stops at a word, you can accept it once by pressing the 1 key with your forefinger, accept it throughout the file by touching 2 with your middle finger, or add the word to the user dictionary with your ring finger on 3. Suggested alternatives pop onto the screen automatically (the program stops looking for them when you press a key). If the word you wanted to type is the first alternative, as it usually is, press the letter A and the right word jumps into the file. You can make any changes you like in the file itself by pressing 4 or an arrow key; the program keeps track of where it left off.

EDITOR'S CHOICE

FACT FILE

***WordPerfect*,**
Version 4.2
WordPerfect Corp.
288 W. Center St.
Orem, UT 84057
(801) 225-5000
List Price: $495
Requires: 256K RAM, two disk drives, DOS 2.0 or later.
In Short: A superb integrated speller: fast, intuitive, effortless, a pleasure to work with. The most bang with the least fuss. But it doesn't flag incorrect capitalization. Not copy protected.

CIRCLE **462** ON READER SERVICE CARD

You can switch to any of a dozen foreign-language dictionaries (sold separately by WordPerfect Corp. at $60 each) by responding to a prompt. A simple macro will automate the process of changing from English to Icelandic, and another one takes you back to English. The speller will also ignore words containing numbers if you so instruct it. And *WordPerfect* includes a utility that lets you add or remove words in the main dictionary or create a main dictionary of your own. Words added to the main dictionary will automatically appear as alternatives and can be used for correction throughout a file. You can also save time by adding any word to a smaller RAM-based list of words frequently used.

Nothing's perfect. *WordPerfect*'s speller doesn't flag capitalization errors and lets some variant forms slip through its net. But everything else about it is a model of style and intelligence. No speller is clearer or simpler to use.

WordStar Professional, Release 4.0

Like everything else about the new *WordStar Professional*, Release 4.0, the speller is not quite as good as it should be and a lot better than you might expect. Its word list, based on the *American Heritage Dictionary*, is excellent both in what it puts in and what it leaves out. When it can figure out the word you intended to write, it flashes it on the screen, and you can interrupt its search at any time. It remembers corrections and reuses them.

MicroPro International Corp. no longer calls its speller *CorrectStar*, although you can find that name hidden in the dictionary files. The speller is nicely integrated into the rest of the program. A couple of keystrokes start it going wherever the cursor happens to be. You can skip over passages you don't want to check and can look up a word on the fly. Legal, medical, and financial dictionaries are available from MicroPro for $25 each.

FACT FILE

***WordStar Professional*,**
Release 4.0
MicroPro International Corp.
33 San Pablo Ave.
San Rafael, CA 94903
(800) 227-5609
(415) 499-1200
List Price: $495
Requires: 256K RAM (320K with thesaurus), two disk drives, DOS 2.0 or later.
In Short: The speller is a lot better than you might expect from *WordStar*. It's slow and homely-looking but effective. Large, well-managed vocabulary. Not copy protected.

CIRCLE **459** ON READER SERVICE CARD

WordStar drags its feet when it checks long files, although you can speed things up a bit by loading the full dictionary into memory. While the spelling screen looks better than it did in earlier versions, that's not saying much, and the speller doesn't include the range of options that belong in a full-priced word processor. Still, it doesn't offer any unpleasant surprises.

XyWrite III Plus

XyWrite's users have waited a long time for a spelling checker. The wait was definitely worth it.

The speller that arrived in *XyWrite III Plus* earlier this year does absolutely everything. Based on a design by Microlytics and Xerox PARC, but hot-rodded and supercharged by XyQuest, this superb program combines all the best features of every other speller on the market. It zips at amazing speed through all or part of a file on-screen, offering instant alternatives as it rushes by. If you tell it to check a group of files on your disk, it reports back by creating a file containing a list of doubtful words. You can delete the words that were correct in the original files and type in the correct forms of the misspelled words—and the program will go back and fix the originals automatically. A similar technique lets you insert the codes needed to compile an index.

EDITOR'S CHOICE

PC MAGAZINE FACT FILE

XyWrite III Plus, **Version 3.5**
XyQuest
P.O. Box 372
Bedford, MA 01730
(617) 275-4439
List Price: $445
Requires: 256K RAM (384K with speller), two disk drives or hard disk. DOS 2.0 or later.
In Short: Swift, solid, and sure. A fully customizable, highly sophisticated speller whose somewhat awkward interface won't slow you down. Not copy protected.

CIRCLE **458** ON READER SERVICE CARD

The whole dictionary stays in memory (though you can unload it at any time), so the program also functions as a real-time speller that doesn't slow you down or beep every time you type a mildly uncommon word. You can also prepare a list of automatic replacements—such as the correct form of words you often mistype or multiple lines of text to replace an abbreviation—and the speller will insert the replacement as you continue to type. It can do all these things either with beeps or without.

The main dictionary is the same one included with *PC Type Right*. *XyWrite* lets you keep multiple personal and specialized dictionaries in memory at the same time; small legal and business dictionaries come with the package. Although you can't alter the main dictionary, you can effectively remove a word by typing it into the personal dictionary followed by a space and a question mark.

XyWrite's speller menu looks a bit awkward, and you'll find that your hands have to move around the keyboard more than you might like, but the program is so fast that you probably won't complain. Later this year, the same speller, with an improved menu and additional features, will be part of *Nota Bene*, Version 3.0, the academic and technical word processor that Dragonfly Software builds around the powerful engine supplied by *XyWrite*. But right now, it's hard to imagine a better spelling checker than the one built into *XyWrite*.

Standalone Spelling Checkers

Editor's Toolkit

BestInfo's *Editor's Toolkit*, one of a set of tools built around *XyWrite*, is sold mostly to publishers—and few private users will be tempted by the $350 price tag. Still, this excellent package is evidently the work of people who care about the English language.

A RAM-resident program, *Editor's Toolkit* combines spelling checker, thesaurus, usage guide, and notepad. Press a hot key and the program checks the spelling of the word marked by the cursor, offering an immediate list of alternatives if it doesn't recognize the word. The compilers of the program's word list have taken a close look at a stylebook. Nonstandard and British spellings are rigorously excluded: *alright* is all wrong here, and *cheques* bounce. Press a different hot key when the cursor is on a word like *review*, and you get a quick usage guide discussing the difference between that word and *revue*. Other hot keys give access to a thesaurus and to a note file that can include up to 500 entries, each attached to a 40-character string in the file. Screen checking, available from a pull-down menu, can be limited to one screen or can continue all the way through the file.

Editor's Toolkit also features a file-comparison utility that highlights differences or flags them with notes, and a set of readability analyses that may be useful to publishers of textbooks and children's books. One odd weakness of the package is that it can't remove words from the user dictionary—you can only expand that file or discard it. A setup facility lets you configure the program for *WordPerfect* or *MultiMate*. You can use it with other word processors, too, if you're willing to put a few minutes' work into configuration. (The compare utility, however, requires *XyWrite*-style ASCII files.)

PC MAGAZINE FACT FILE

Editor's Toolkit
BestInfo Inc.
1400 N. Providence Rd., #117
Media, PA 19063
(215) 891-6500
List Price: $350
Requires: 512K RAM, hard disk, DOS 2.1 or later.

In Short: Highly competent resident speller and thesaurus, with file comparisons, add-in notes, and other utilities. Designed for publishers; best suited to *XyWrite*. Not copy protected.

CIRCLE **609** ON READER SERVICE CARD

The speller and thesaurus recently added to *XyWrite* have rendered some features of *Editor's Toolkit* superfluous and even more extravagantly overpriced. Nonetheless, it's still a well-designed set of programs.

Electric Webster

Noah Webster knew a lot more words than *Electric Webster* does. This Cornucopia Software package bills itself as a do-everything program: "spelling checker—autohyphenation—grammar checker," it says on the front of the manual. But the DOS version dates back to 1983 and has long since begun to show signs of age.

The program recognized *angst* and *anorexia*, but it flagged almost every one of the foreign and specialized words in our test, and it didn't like the compound words either. It accepted *selfness* and *alright* and didn't reject British spellings. When asked for alternatives, the program doesn't try to find the right word; it simply scrolls through a screenful of words in alphabetical order, leaving a question mark where the flagged word would be if the dictionary included it. You can't see any of the flagged words in context until after the program has asked you to act on all the doubtful words individually.

PC MAGAZINE FACT FILE

***Electric Webster*,**
Version 2.0e
Cornucopia
Software Inc.
P.O. Box 6111
Albany, CA 94706
(415) 528-7000
List Price: $129.95

Requires: 64K RAM, one disk drive, DOS 1.0 or later.

In Short: An ancient and expensive program that checks spelling, grammar, and style, none of them effectively. Not copy protected.

CIRCLE **608** ON READER SERVICE CARD

Other programs included on the disk can insert soft hyphens in a file, perform some rudimentary grammar-and-style checks, and make a few rather effective punctuation checks. For this, Cornucopia Software expects you to pay $129.95. Noah Webster probably had a few choice words for that.

G-Spell

G-Spell illustrates one of the basic rules of computing: the cheaper the program, the more often it beeps. This $9.95 spelling checker from Pico Publishing bleats unpleasantly every time it finds a word it doesn't know. And that's just the beginning of its problems.

G-Spell has the most awkward and annoying system of prompts and menus I've seen in any program—ever. Give it a simple file that includes only words in its dictionary and *G-Spell* zips through it at top speed. But if you need to find a replacement for a word you're not sure about, settle down for a long wait. This program flatters itself, too: during its interminable lookup routine, it displays the message "Thinking. . . ."

PC MAGAZINE FACT FILE

***G-Spell*, Version 4.0**
Pico Publishing
512 Paramount Bldg.
305 2nd St. S.E.
Cedar Rapids, IA 52401
(319) 362-6964
List Price: $9.95
Requires: 256K RAM, one disk drive, DOS 2.0 or later.
In Short: The slowest lookups and most awkward menus, but if you want a ten-dollar speller, this one fills the bill. Not copy protected.

CIRCLE 607 ON READER SERVICE CARD

Unlike every other speller, *G-Spell* displays its suggestions one at a time, waiting for you to answer Yes or No to each one. (Luckily, you can interrupt the process by banging on any key.) If you accept or correct a word, you're asked if you want to do this only once or throughout the file. You have to type the right letter in response, and you can't press Enter to use a default.

After only a few minutes with *G-Spell*, I never wanted to see the program again. Which illustrates another rule: you don't get what you don't pay for.

Jet:Spell

Polyglot's *Jet:Spell* doesn't exactly jet, but it certainly is polyglot. You can buy dictionaries in 11 languages and switch from one to the other as you switch documents. You can also change the program's prompts among a smaller number of languages. The program is impressively careful with details, too. It gives specific warnings when you misuse capitals or combine letters and numbers in ways it doesn't expect. In languages that hyphenate certain combinations of verbs and pronouns (as in "Que sais-je?") the Polyglot package points out subject-verb disagreement.

Jet:Spell offers a convenient directory feature that lets you point to the file you want to review. During checking, eight lines of context appear in one window, while other windows frame the suspect word or offer messages. A Lotus-style command menu stretches across the bot-

FACT FILE

***Jet:Spell*, Version 2.0**
Polyglot Inc.
2450 Central Ave.
Boulder, CO 80301
(303) 449-7002

List Price: *Multilingual Jet:Spell* (includes any one language), $109.95; *Monolingual Jet:Spell* (American English only), $49.95; additional language dictionaries for *Multilingual Jet:Spell*, $59.95.

Requires: 384K RAM, two disk drives (hard disk recommended), DOS 2.0 or later.

In Short: Not the fastest or the easiest, but it checks spellings in 11 languages. Not copy protected.

CIRCLE **606** ON READER SERVICE CARD

tom of the screen, though in the current release you can't use initial letters to choose a command.

Except for its language abilities, the current version of *Jet:Spell* is competent but unexceptional. But Version 3.0, due in early fall, will include some uniquely desirable features. For example, though the current version reads only ASCII files, the next one will let you configure it to read *WordPerfect*, *WordStar*, *Microsoft Word*, *MultiMate*, and *Framework* documents as well as files created by some word processing programs popular in Europe but unknown in America. You'll be able to choose commands with only a single letter. The new release will let you switch languages in mid-document when it finds a preset code, will start checking at any specified string, and will include enlarged dictionaries better able to cope with the compound words of Dutch and German. All of which should make for a program that's truly polymath.

LSpell

When *Turbo Lightning* first flashed across the skies, some users asked if its dictionaries and lookup engine could be used for checking completed documents. Borland International said it couldn't be done. Chris Dunford proved that it could. *LSpell* doesn't pretend to be a finished product, and it's too slow for use with long files.

But it works—and it doesn't cost a dime.

To get *LSpell*, simply download it from any good BBS (or buy it from the disk libraries maintained by many user groups). The program takes a free ride on *Turbo Lightning*, which must be resident before *LSpell* starts to work. Reading slowly through ASCII files, line by line, *LSpell* stops at each doubtful word. You can ask for a phonetic lookup (performed via *Turbo Lightning*), or replace the word, or add it to *Turbo Lightning*'s dictionary. *LSpell* also lets you escape at any time. And at the end you get a word count.

Why didn't Borland think of this?

FACT FILE

***LSpell*, Version 0.93**
Christopher J. Dunford
The Cove Software Group
(301) 992-9371
List Price: Free when downloaded from a bulletin board or CompuServe.
Requires: 45K RAM, one disk drive, DOS 2.0 or later, *Turbo Lightning*.
In Short: A test/demo version of a document spelling checker using the *Turbo Lightning* dictionaries. Much too slow for use with long files, but it's hard to complain about a free add-on. Not copy protected.

MicroSpell

MicroSpell, from Trigram Systems, is a $69.95 package that roars through files like an orthographic superhero, knocking down misspelled words, correcting typos, catching misplaced capitals and apostrophes without a moment's pause, and, if you so direct, leaping over foreign or technical passages in a single bound. Its X-ray eyes see through impostors like *fro* and *indiscrete*, but it can also stop on a dime and undo its last five actions. The screen reminds you of Clark Kent and the manual of Perry White, but the program itself has superpowers by the dozen.

Everything operates in RAM, and that makes this speller a real speed demon. When *MicroSpell* finds a doubtful word, it offers the right alternative before you can remember what you meant to say. It knows that *twowords* should be two words (although it also offers *towards*). When one copy of my test script happened to jam together *noisemaker* and *pacemaker*, the program divided them neatly. It can repeat the same correction automatically, but lets you confirm or reject it each time. If you want to revise more than one word at a time, the program even includes a rudimentary text editor.

EDITOR'S CHOICE

PC MAGAZINE FACT FILE

***MicroSpell*, Version 7.4**
Trigram Systems
5840 Northumberland
St.
Pittsburgh, PA 15217
(412) 422-8976
List Price: $69.95
Requires: 128K RAM (320K recommended), one disk drive (hard disk recommended), DOS 2.0 or later.
In Short: The best of the standalone spellers: quick, smart, and packed with features. It even lets you edit within the text. Not copy protected.
CIRCLE 602 ON READER SERVICE CARD

Though *MicroSpell* traces its ancestry to the early days of the PC, it's been completely rewritten for the latest release, which we tested in a beta version. You can customize it from top to bottom, too, telling it whether to accept foreign characters, whether to check words with numbers or capitals, whether to flag double words, whether to accept possessives or contractions, and more. You can even update or replace the main dictionary.

MicroSpell is the best of the standalone spellers, and one of the least hostile. Configuration files let you adapt the program to most major word processors; moreover, the author will respond to requests for further customization. One other advantage is worth mentioning: this is one of the few programs that works with *Microsoft Word* files—and it does a better job with them than *Word* does.

Paperback Speller

This would be an excellent speller at any price if it weren't copy protected. As it is, the program costs $39.95. If you can live with its key-disk requirement or are willing to pay an extra $10 for an unprotected disk, you get an earlier version of *MicroSpell*, distributed by Paperback Software under license, and without some of the original *MicroSpell* options. Like the new *MicroSpell*, *Paperback Speller* is shrewd and speedy: it automatically corrects *alright* to *all right*, displays alternatives instantly, knows how to divide words you

PC MAGAZINE FACT FILE

Paperback Speller, **Version 1.0**
Paperback Software
2830 Ninth St.
Berkeley, CA 94710
(415) 644-2116
List Price: $39.95 ($10 additional for non-copy-protected disk).
Requires: 128K RAM, two disk drives or hard disk, DOS 2.0 or later.
In Short: Impressively fast and smart. One of the best—except that it's copy protected.

CIRCLE **550** ON READER SERVICE CARD

accidentally jammed together, and lets you customize the main dictionary.

Paperback Speller does its job quickly and effectively, and its manual is one of the best. But Version 7.0 of *MicroSpell* simply outclasses it—and *MicroSpell* has never insulted its customers with copy protection.

PC/Spell

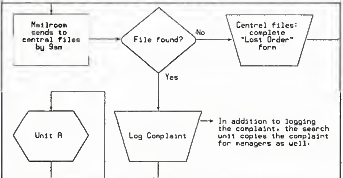
I know a programmer who writes an article every year that predicts that the future belongs to UNIX. Last April, when IBM Corp. announced that its new machines would use OS/2, he burst into tears. *PC/Spell* should help ease his disappointment.

UNIX comes with lots of little utilities that you don't get with DOS. One of them, SPELL, compares a document to a stan-

PC MAGAZINE FACT FILE

***PC/Spell*, Version 1.1**
Custom Software Systems
P.O. Box 678
Natick, MA 01760
(617) 653-2555
List Price: $49
Requires: 96K RAM, one disk drive, DOS 1.0 or later.
In Short: All it does is list words it doesn't recognize. It lets you figure out how to correct them. Its algorithm accepts nonsense combinations. Not copy protected.

CIRCLE **549** ON READER SERVICE CARD


Mailroom sends to central files by 9am
File found?
No
Centrel files: complete "Lost Order" form
Yes
Unit A
Log Complaint
In addition to logging the complaint, the search unit copies the complaint for menagers as well.

dard list of words (and an optional user-defined list of additional entries) and types out a list of words in the file that don't match the words in the dictionary. SPELL isn't worth much, but UNIX throws it in for nothing; Custom Software Systems' *PC/Spell* imitates this free utility in the DOS world at a cost of $49.

PC/Spell doesn't pause over doubtful words or display them in context. It simply directs them to the screen or a file. Also, it uses algorithms that combine stems and suffixes, so it accepts *plantly*, *preliftable*, *undial*, and *doorly*. If you want, you can include additional word stems to its database to make it accept even more nonsense words. The program doesn't support all the options in the UNIX version, however—a command-line switch in UNIX lets SPELL accept nonsense words in British English, while *PC/Spell*, though it incorporates the same switch, accepts onlv American nonsense.

If you're really nostalgic for UNI
you may find *PC/Spell* worthwhile. Othe
wise, you might as well avoid it.

PC Type Right

It's not a disk—it's a box. Xerox Corp.
$199.95 PC Type Right sits between yo
keyboard and computer and softly bee
twice when you type a word not in its cap
cious dictionary. It doesn't offer altern
tives. It just beeps.

You can add a maximum of 1,2
words to its box-based personal dicti
nary, and when it starts to overflow, t
last words in are the first ones out. Vario
Alt-key combinations or commands en
ing in the @ symbol let you switch the b
on and off or change its configuration. B
cause different word processing progra
use keys like Backspace and Del differe
ly, the box provides a half-dozen differe
configurations and also lets you write yo
own.

Like the *Word Finder* thesaurus, I

FACT FILE

PC Type Right
Xerox Corp.
Xerox Sq.
Rochester, NY 14644
(800) 822-2200

List Price: $199.95; cable, $19.95.

Requires: IBM or compatible; version available for AT&T or Xerox computer.

In Short: An add-on box that intercepts keystrokes between the keyboard and the computer; uses no RAM or disk space. Noisy, but compatible and effective.

CIRCLE 548 ON READER SERVICE CARD

Push Button Micro - Mainframe Computing For Your Entire User Base

Computer Professionals

- Create and Package Custom Applications quickly and easily
- A Scripting Language for automating PC & mainframe sessions
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- Simple interactive Menu Manager for all DOS applications + keystroke macros
- CICS, TSO, VM, VAX, Wang, Compustat ... all available from a single menu
- High performance File Transfer identical across asynch and bisynch lines — 100% error free
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Business Professional

- Executive Workstations
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- Electronic Mail
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- Easy access to outside Information Services
- Automated PC and mainframe sessions with the push of a button
- Interface to 1-2-3, Symphony, PROFS & dBase III
- Easy access to corporate data of all kinds

SCA Products
&Services, Inc.

Gateway PC

The Corporate Standard

Increased Productivity for every PC user

GATEWAY PC was designed to increase the productivity of the PC user at every experience level so a company can standardize on it and simplify corporate communications

Application Developer

GATEWAY PC gives the Application Developer all the tools to create and package custom applications on the PC or mainframe, or in conjunction with one another. The special screen compiler allows developers to redesign screen formats to meet specific application needs. Using GATEWAY PC, an unlimited number of password protected menus can be created - with as many as thirty items on each menu. Function keys can be changed and added with ease. And GATEWAY PC is table driven to simplify standardized and customized operations. GATEWAY PC's Autopilot script automates mainframe and PC sessions, and scripts can be initiated from the mainframe or the PC. A bonus feature of GATEWAY PC is Autopilot Auto-Record which remembers a mainframe session and automatically creates an Autopilot Script for added efficiency. No other product gives the program developer as many tools and as much flexibility as GATEWAY PC.

What makes GATEWAY PC different is Autopilot Script, a powerful programming language that tailors an environment to the end users ever changing needs...

Autopilot, an extensive interpretive scripting language used to automate mainframe and PC sessions, from a simple activity like LOGON to the most complex of applications—all which can be executed from a PC menu item. Scripts can be initiated from the mainframe as well as the PC. Anything that can be accomplished manually on any mainframe can be automated via Autopilot, such as logging onto a mainframe and retrieving electronic mail which is eventually destined for the PC printer. With the power of Autopilot script, PC's can also be programed as automatic operators to manage networks and similar functions, freeing users from routine tasks.

PC Support Group

PC Support Groups now have maximum functionality with one product, because GATEWAY PC replaces a myriad of other products that accomplish only part of what this package does. And working in GATEWAY PC's protected environment allows free movement from one application or software product to another. GATEWAY PC supports the entire spectrum of hardware and software in the micro, mainframe, and Local Area Network arenas and offers both asynchronous and bisynchronous support, as well. GATEWAY PC's high performance binary and text File Transfer for TSO and CMS makes software distribution painless. And File Transfers can occur from one PC to another or to a mini. Furthermore, with GATEWAY PC customized installation is fast and easy. No other package is as comprehensive as GATEWAY PC.

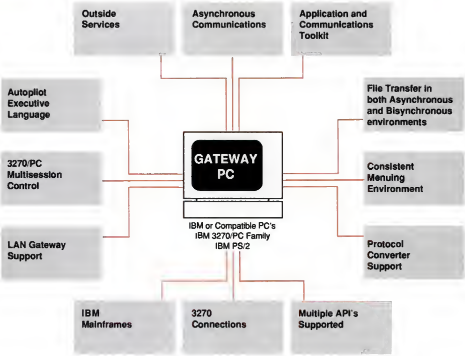
Business Executive

For the Business Executive with little or no computing experience, GATEWAY PC with Autopilot provides a foolproof system, offering more push button functions than ever before. It insulates the end user from awkward commands and from the complexities of switching environments by operating in a simple and consistent manner. Lotus spreadsheets can be built before the user's eyes. Sales projections and inventory updates are calculated with a single keystroke. PROFS electronic mail is streamlined and getting the latest Dow Jones quotes or any other outside service can be as easy as a single word. Running, viewing and printing standard reports is a breeze with GATEWAY PC, and automatic logons make start ups quick and easy. GATEWAY PC makes any software package accessible to the business user in a consistent push button fashion. And best of all, GATEWAY PC can be mastered in less than one half hour.

The Menu Manager provides push button access to products, commands, as well as custom applications on both the PC and mainframe. It further includes a fully prompted facility so menus can easily be created, changed and linked together on one PC or a whole network of PC's.

The Micro-Mainframe Link, in conjunction with GATEWAY MAINFRAME lets business professionals, without any knowledge of mainframes or communications, extract and download formulas and data available to FOCUS and RAMIS II. From this information GATEWAY PC automatically builds spreadsheets for 1-2-3 and Symphony, and files for dBASE III. GATEWAY PC can communicate with any mini including VAX, H P, Wang, etc., and transfer data using the XMODEM protocol. Most 3278 boards and asynchronous protocols work as well. GATEWAY PC features like File Transfer and Autopilot Script can be initiated from mainframe applications using the same commands whether asynch or bisynch. No other product gives such an extensive range of capabilities as GATEWAY PC

Connectivity/*Productivity*



Outside Services

Asynchronous Communications

Application and Communications Toolkit

Autopilot Executive Language

File Transfer in both Asynchronous and Bisynchronous environments

GATEWAY PC

3270/PC Multisession Control

Consistent Menuing Environment

IBM or Compatible PC's
IBM 3270/PC Family
IBM PS/2

LAN Gateway Support

Protocol Converter Support

IBM Mainframes

3270 Connections

Multiple API's Supported

System Data

GATEWAY PC runs on the IBM PS/2, PC/XT/AT/3270 PC and compatibles.

IBM mainframe communication is provided synchronously for:

- IRMA board from DCA
- FORTE board from FORTE
- CXI board with IRMA compatible software from CXI
- 3278 board from IBM
- IBM 3270 PC

Asynchronous communication is provided for:

- 3101
- VT100 and VT52
- TTY
- X.PC
- XMODEM

File Transfer and mainframe data extract works with GATEWAY under IBM's VM and TSO. SNA is supported. Other hosts can be accessed through GATEWAY PC asynchronous communication. Tymnet Services and Public Domain File Transfer are accomplished using X.PC and XMODEM respectively.

GATEWAY PC is designed to work independently or in tandem with GATEWAY MAINFRAME... both have the same consistent environment.

The GATEWAY PC Environment requires 30-80K of memory, depending on the number of menu levels and specific features in use. Mainframe communication functions may require up to 320K of memory. GATEWAY PC is not copy protected.

Minimum memory of 512K and a hard disk are recommended. GATEWAY PC supports DOS levels 2.0 or above. Hard disk space of up to 1M or two floppy disks is also recommended.

IBM, DCA, CXI and FORTE are marks of their respective companies.

CIRCLE 322 ON READER SERVICE CARD

SCA Products and Services, Inc.
353 Lexington Avenue
New York, NY 10016
212. 532. 2990

Type Right was developed by Microlytics together with Xerox PARC. I've never met a plastic box with a richer and more precise vocabulary. It warns you about British forms and words like *alright*. It catches letters typed immediately after punctuation—a habit that gets in the way when you type COMMAND.COM but helps in ordinary word processing. And it beeps at repeated words.

A souped-up version, due later this year, will include a RAM-resident program that can talk to the box and display pop-up menus of alternative spellings. The program will also use the box to check whole documents written in most major word processor formats. The *Word Finder* thesaurus will also sit in the new box, and you'll be able to buy optional add-ons like foreign dictionaries. To switch from English to French, just press a few keys and the box starts comparing your keystrokes to its French word list instead of its English one. Meanwhile, you'll be able to clear out all those huge dictionary and thesaurus files from your hard disk.

While I was typing this article, PC Type Right caught errors I wouldn't have noticed otherwise, but it also tended to get confused by a lot of backspacing and editing, and it often beeped for no good reason. Whether you'll find this addition useful really depends on your typing style.

Professional Spelling Checker

This one is small and simple. Newline Software's *Professional Spelling Checker* merely scrolls through a file, stopping at any word it doesn't recognize. If you think the word is correct, press Enter and continue. If it's wrong, you'll have to thumb through a printed dictionary and type in the correction at the prompt. *Professional Spelling Checker* has never heard of *boxing*, but it's the only program we found that includes *DiMaggio* in the speller's Hall of Fame. Unfortunately, it also accepts misspelled words like *indispensible* and *preceeding*.

For your $49 you also get 26 other files, each of which consists of a list of words that you can modify and run through a supplied utility to create a dictionary of your own design.

PC MAGAZINE FACT FILE

***Professional Spelling Checker*, Version 2.1**
Newline Software
P.O. Box 289
Tiverton, RI 02878
(401) 624-3322

List Price: $49

Requires: 192K RAM, one disk drive (hard disk recommended), DOS 2.0 or later.

In Short: Slow and simple; it doesn't offer alternatives, but it knows words the others don't (and some words that don't exist), and it lets you build your own dictionary. Not copy protected.

CIRCLE **547** ON READER SERVICE CARD

The Random House ProofReader

Meet the venerable granddaddy of all serious spelling programs. Primitive as it seems today, it still displays a clarity of design that many of its successors might envy.

The vocabulary in Digital Marketing's $50 *The Random House ProofReader* is more than adequate and isn't burdened by rare words. The program encourages consistency (not to mention patriotism) by excluding British spellings. When it finishes scanning a file, it offers to show you all the flagged words at once. Then it lets you type in corrections for each word, while you look at two lines of context in the original file. "Dictionary help" gives you the words closest in the alphabet to the doubtful one, though this won't help you with misspellings like *recieve*. It inserts corrections in your file using whatever capitalization you type at the prompt, instead of trying to match the capitalization of the original word.

All in all, *The Random House ProofReader* is a beautiful museum piece, still available to anyone who doesn't know about its faster and sturdier successors.

PC MAGAZINE FACT FILE

The Random House ProofReader
Digital Marketing
1136 Saranap Ave.
P.O. Box 2010
Walnut Creek, CA
94595
(415) 947-1000

List Price: $50

Requires: 64K RAM, one disk drive, DOS 1.0 or later.

In Short: The dictionary is among the best, but the program can't approach today's competition. Not copy protected.

CIRCLE **546** ON READER SERVICE CARD

Reference Set

Reference Set, from Reference Software, is excellent in some of its capabilities and less than excellent in others. This $89 program is compatible with almost anything you can throw at it, and with add-ins now starting to become available, it will let you look up just about everything you might want to know.

This gigantic program includes a resident speller, a resident thesaurus, a standalone document checker, and a limited keyboard macro facility. The resident speller doesn't beep, but when you press a hot key it's quick to display a half-screen of alternative spellings if it doesn't recognize the word marked by the cursor. It often displays too many alternatives, and you may have to exercise your cursor finger to get to the one you want.

Like the other spellers that use Random House dictionaries, *Reference Set* does a good job of trapping British spellings and real words that you probably didn't intend to type. Another strong point is its ability to display hyphenation if asked. And it is the one program that can distinguish *great-aunt* from *great-ant*. A screen-check mode highlights doubtful words at satisfying speed. The highlights disappear as soon as you move the cursor, but another hot key turns them on again so you can review your progress. Documentation for the new version of *Reference Set* wasn't ready in time for this review, but it hardly mattered. This program virtually runs itself.

Reference Set's strongest feature will probably be its range of alternative dictionaries, which are supposed to begin appearing around the time this issue of *PC*

FACT FILE

***Reference Set*,**
Version 3.0
Reference Software
330 Townsend St., #131
San Francisco, CA
94107
(800) 872-9933
(415) 541-0222

List Price: $89; $49 extra for each of the following add-on dictionaries: ***Black's Law Dictionary*, *Stedman's Medical Dictionary*,** or ***Oil-Speil Dictionary*.**

Requires: 128K RAM, hard disk, DOS 2.0 or later.

In Short: Powerful on-line thesaurus and spelling checker (no beeps), with other reference works as add-ons. The document checker is the weakest part of the package. The kind of reference works promised for *Turbo Lightning* are beginning to appear with *Reference Set*. Not copy protected.

CIRCLE **544** ON READER SERVICE CARD

Magazine hits the streets. You won't need CD-ROM to use medical or law dictionaries; they'll be available at the touch of a key. International thesauri and dictionaries are also on the way, complete with multilingual hyphenation. A "construction set," scheduled for next year, will let you turn your own data files (from *dBASE III*, *1-2-3*, and other programs) into customized pop-up reference works.

The weakest part of this reference empire is the standalone document checker. It's clearly just an updated and improved version of the old *Random House ProofReader*—and it doesn't approach the quality of the best recent standalone spellers.

Spellin!

Turner Hall Publishing's $79.95 *Spellin!* is an add-in speller for *1-2-3* and *Symphony*; it won't install without the Lotus PrintGraph files on your disk. Though specialized, the program is effective and accurate.

FACT FILE

***Spellin!*, Version 1.0**
Turner Hall Publishing
Divison of Symantec
Corp.
10201 Torre Ave.
Cupertino, CA 95014
(408) 253-9600
List Price: $79.95

Requires: 320K RAM, two disk drives or hard disk, DOS 2.0 or later; *1-2-3*, Version 2.0 or 2.01, or *Symphony*, Version 1.1 or 1.2.

In Short: An add-in speller for your spreadsheet or *Symphony* file. You have to prompt it for alternatives, but its menu structure is the best available. Not too slow for its intended purpose. Not copy protected.

CIRCLE **543** ON READER SERVICE CARD

Spellin! has the most extensive and up-to-date technical and specialized vocabulary of any program we tested—far better than in *Manuscript*. Its lookup routines (written by Borland) are painfully slow, but you probably won't use it on very large files. You also have to ask for alternative spellings, something that shouldn't be necessary today. The program uses the best of all methods for repeated corrections, however: the second time the same misspelled word turns up, *Spellin!* offers the correction you made the first time and asks if you want to repeat it throughout the document. *Spellin!* also provides a search-and-replace capability that *1-2-3* should have included long ago.

The Lotus-style menus make *Spellin!* look like an integral part of *1-2-3*, and the documentation is among the best. For its purpose, this program's not a bad bet.

Spellix

If you use Emerging Technology Consultants' $95 *The Professional Writer's Package* for editing and formatting, you probably already have *Spellix*. If you don't use that package, *Spellix* won't interest you at all; it's designed to work with files created by *PWP*'s *Edix*, *Wordix*, and other *ix* programs. Unfortunately, the program seems ponderous and limited.

PC MAGAZINE FACT FILE

***Spellix*, Version 3.01**
Emerging Technology Consultants Inc.
4760 Walnut St.
Boulder, CO 80301
(800) 782-4896
(303) 447-9495
List Price: $95

Requires: 384K RAM (512K RAM recommended), two disk drives, DOS 2.0 or later.
In Short: Useful only if you're using *The Professional Writer's Package* of editing and formatting programs that run on DOS, UNIX, and Xenix machines. Not copy protected.

CIRCLE 542 ON READER SERVICE CARD

You have to keep giving *Spellix* orders before it does anything. Also, though it knows a lot of words, it doesn't recognize mistaken capitals, and its treatment of British forms is inconsistent. *Spellix* is sold as a separate program but can't handle pure ASCII files from other editors unless all the lines are short and end with carriage returns.

Still, if you share files with *PWP* users working on UNIX and Xenix systems, this is the speller you need.

Strike

Strike is a resident spelling checker that can either beep at you or check a screen or paragraph. At $49.95, it's half the price of *Turbo Lightning* and knows a trick or two that Borland doesn't, but it doesn't try to match its better-known rival in features or performance. S&K Technology uses a 50,000-word dictionary loaded entirely into memory for instant access. (*Turbo Lightning*, unless you use a RAMdisk, gets slowed down by disk reads when checking uncommon words.) But *Strike* has a limited vocabulary—it flagged all the foreign and specialized words in our test except for *reboot*—and its menus slow things down by scrolling gradually onto the screen instead of popping up.

Strike has other annoying habits. If you ask it to check the word it just beeped at, it will try to offer some alternatives, but if you then move the cursor around the

screen to some other word, the program continues to regard the first word as the word you're interested in until you tell it differently. After checking a paragraph or screen, *Strike* keeps the highlighting on the suspect words until you reach them with the cursor, something *Turbo Lightning* can't do. Unfortunately, *Strike* tends to lose track of character deletions and corrections while you type, letting you misspell words that it would catch otherwise. It also has trouble correctly replacing words on centered lines.

PC MAGAZINE FACT FILE

Strike, **Version 1.1**
S&K Technology
4610 Spotted Oak
Woods
San Antonio, TX 78249
(512) 492-3384
List Price: $49.95
Requires: 256K RAM, one disk drive, DOS 1.0 or later.
In Short: Slow and unreliable as a resident spelling checker, frustrating to use as a screen or paragraph checker. Not copy protected.
CIRCLE 469 ON READER SERVICE CARD

If your heart yearns for a RAM-resident speller, stick with *Turbo Lightning*. *Strike* offers no real competition.

Turbo Lightning

The publicity thunder that heralded *Turbo Lightning* left a lot of people skeptical. While the program was under development, Borland International referred to it under the code name "Rambo," but didn't say what it was for. When Rambo finally appeared, he turned out to be a wimpy busybody who got upset about misspellings and chirped softly whenever you got a word wrong. What's more, Borland never kept its promise to arm Rambo to the teeth with disk-based reference sources and send him charging into your computers to change your life forever.

Turbo Lightning still won't change your life, but it does know how to spell, and Borland has made a lot of small improvements since the first release. Although the resident thesaurus is too small and disorganized to be of much use, the resident dictionary is one of the best. Another computerized incarnation of the *Random House Dictionary*, *Turbo Lightning* has a large and accurate vocabulary and knows how to page through it quickly. And Borland's dictionary windows are the most elegant to be found on any screen.

Among *Turbo Lightning*'s strong points are its seamless integration of the user dictionary and the main dictionary

EDITOR'S CHOICE

PC MAGAZINE FACT FILE

***Turbo Lightning*, Version 1.02A**
Borland International Inc.
4585 Scotts Valley Dr.
Scotts Valley, CA 95066
(800) 255-8008
(800) 742-1133 (in Calif.)

List Price: $99.95

Requires: 128K RAM, two disk drives, DOS 2.0 or later.

In Short: A real-time spelling checker with an excellent dictionary and a moderately good thesaurus. Elegant design. Complicated installation. Not copy protected.

CIRCLE **466** ON READER SERVICE CARD

and its ability to configure itself for almost any program you can imagine. It knows whether it's in an application or in DOS, adjusting itself automatically to each environment. It doesn't make you drag the cursor through dozens of alternatives for every misspelling, as *Reference Set* tends to do. Among its minor weak points are a lookup algorithm that tends to offer alternative words of the same length as the misspelled one—unlike more-sophisticated programs, which seek other kinds of similarities first. Another negative is a screen-check mode that loses all highlighting when you touch a key. The program's beeping mode slows down 8088 machines but works effectively in faster models.

You'll be disappointed if you get *Turbo Lightning* for its resident thesaurus, though improvements are promised for the next version. Meanwhile, if you need a resident speller, for $99.95, this is the one to buy.

V-Spell

CompuView Products' $79 *V-Spell* is a mixture of good and bad points, with the good ones predominating. It has a serviceable (if unexceptional) vocabulary; it lets you customize virtually everything about its operation, including the main dictionary; and it can zip through a file and insert hyphenation points for typesetting—and its hyphenation is based on a dictionary rather than on rules, so it doesn't make silly mistakes that you'll have to correct.

The bad points, therefore, are especially frustrating. Apostrophes give this program trouble. When I tried to correct *do'nt*, *V-Spell* insisted on treating it as two words and left me with *do'dont*. It refused to insert an apostrophe in *wouldnt*. (It did, however, let me mark these words in the file for revision later.) Its lookup routines aren't especially good at sorting out trans-

FACT FILE

***V-Spell*, Version 1.07b**
CompuView
Products Inc.
1955 Pauline Blvd.,
#300
Ann Arbor, MI 48103
(313) 996-1299
List Price: $79

Requires: 96K RAM, two disk drives or hard disk, DOS 2.0 or later.

In Short: Very quick lookups, but requires too many keystrokes to make it a contender. Useful for hyphenating files. Not copy protected.

CIRCLE **467** ON READER SERVICE CARD

posed letters, and the program doesn't check for capitalization.

If you need to insert accurate hyphenation into your files, *V-Spell* is the program to buy. Think of the spelling checker as a moderately useful bonus.

Webster's Electronic Thesaurus

It's easy to confuse Proximity's Webster with all those other Websters out there. Legally, anyone can put out a dictionary and call it Webster's. *Webster's Electronic Thesaurus*, in contrast, has some legal claim to a relationship with Noah himself: the program is based on a thesaurus published by Merriam-Webster, the company that bought the rights to Webster's original dictionary in the mid-nineteenth century.

For all its distinguished ancestry, this $89.95 program is relatively ho-hum. As a thesaurus it works well, offering detailed distinctions between different meanings of a word. The spelling checker, however, is rudimentary. True, if the program doesn't find the word, it will offer some alternative spellings. And unlike most other thesaurus programs, which simply display an alphabetical word list, Proximity's at least tries to think of the word you really had in mind. But the program's vocabulary isn't extensive—it doesn't include any of the foreign or specialized words in our test, except for *intelligentsia*. On the other hand, it does an excellent job of recognizing hyphenated compounds like *hocus-pocus*, and its style of operation is completely configurable.

The manual, however, inspires little confidence in the linguistic abilities of this program's authors. I'm still trying to make sense of this tidbit: "True, the concept synonym can only be realized in terms of words, since meaning is an attribute of words. Nonetheless, synonymy is a property of meanings and should be presented accordingly." Maybe someone at Proximity should buy a thesaurus.

FACT FILE

***Webster's Electronic Thesaurus*, Version 1.0**
Proximity
3511 NE 22nd Ave.
Fort Lauderdale, FL
33308
(800) 543-3511
(305) 566-3511
List Price: $89.95

Requires: 256K RAM, two disk drives, DOS 2.0 or later.

In Short: A resident thesaurus that offers alternative spellings if it can't find the word you ask it to check. The vocabulary is too small to make it worthwhile as a resident speller. Not copy protected.

CIRCLE **468** ON READER SERVICE CARD

Webster's New World Spelling Checker

With the liveliest screens and the most eye-catching packaging, the $59.95 *Webster's New World Spelling Checker* looks like a winner. Simon & Schuster, publisher of *Webster's New World Dictionary*, combined its list of words with program code written by Korenthal Associates and came up with a speller that's a pleasure to use. Whether the results are equally pleasurable is another question.

There's no question that *Webster's New World* is highly competent. It takes you smoothly through all phases of its operation. You can look at a list of doubtful words before you start correcting the file and can mark off words that you know are right. This seems like a timesaver, but you may spend more time moving the cursor around the screen than you would spend if you simply accepted each word when it appeared in the correction phase. The correction screen is packed with choices but is cleanly designed. *Webster's New World* lets you page through its word list and gape at the odd words that pass by for your amusement. Some, like *clonkers*, can't be found in the printed *Webster's New World Dictionary*.

FACT FILE

***Webster's New World Spelling Checker*, Version 1.4**
Simon & Schuster
Software
1 Gulf + Western Plaza
New York, NY 10023
(800) 624-0023

List Price: $59.95

Requires: 128K RAM, one disk drive, DOS 1.1 or later.

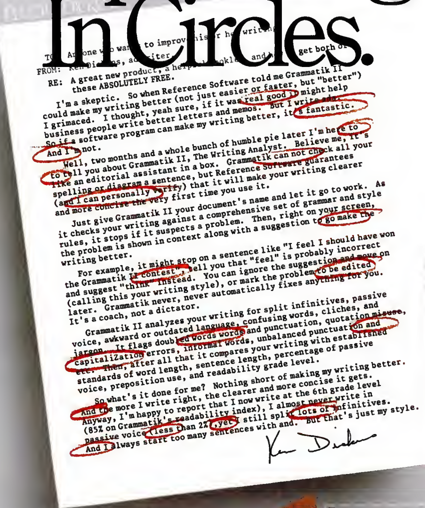
In Short: The best-looking standalone speller, but it can't handle capitals and chokes on long files. Doesn't flag British forms. Not copy protected.

CIRCLE **466** ON READER SERVICE CARD

The program doesn't fully live up to its ambitions. It has an oversized vocabulary; the program won't stop you if you spell *whisky* on one page and *whiskey* the next. In fact, it accepts virtually any familiar variant you can think of. It replaces a misspelled capitalized word with a capitalized correct one, but it can't recognize words like *caPital* that have a capital in the wrong place. It takes its time searching for alternatives, too, although it lets you narrow the search if you get impatient.

You'll hit the most serious problem in *Webster's New World* when you try to correct a long file that includes many different words. The program has no trouble with simple text, but if you use technical vocabulary or a lot of proper names in a file of 40K bytes or more, the program will grind away for a few moments, then dump you back into DOS with the message, "Too many unique words in document." The manual suggests that you deal with this problem by splitting the document into two pieces. When I read this, I was tempted to split the manual into two pieces.

Stop Writing In Circles.



TO: Anyone who wants to improve his or her writing

FROM: Ken Dickens, adwriter

RE: A great new product, a helpful booklet, and how to get both of these ABSOLUTELY FREE.

I'm a skeptic. So when Reference Software told me Grammatik II could make my writing better (not just easier or faster, but "better") I grimaced. I thought, yeah sure, if it was real good it might help business people write better letters and memos. But I write ads. So if a software program can make my writing better, it's fantastic. And I'm not.

Well, two months and a whole bunch of humble pie later I'm here to to tell you about Grammatik II, The Writing Analyst. Believe me, it's like an editorial assistant in a box. Grammatik can not check all your spelling or diagram a sentence, but Reference Software guarantees (and I can personally verify) that it will make your writing clearer and more concise the very first time you use it.

Just give Grammatik II your document's name and let it go to work. As it checks your writing against a comprehensive set of grammar and style rules, it stops if it suspects a problem. Then, right on your screen, the problem is shown in context along with a suggestion to go make the writing better.

For example, it might stop on a sentence like "I feel I should have won the Grammatik II contest", tell you that "feel" is probably incorrect and suggest "think" instead. You can ignore the suggestion and move on (calling this your writing style), or mark the problem to be edited later. Grammatik never, never automatically fixes anything for you. It's a coach, not a dictator.

Grammatik II analyzes your writing for split infinitives, passive voice, awkward or outdated language, confusing words, cliches, and jargon. It flags doubled words words and punctuation, quotation misuse, capitaliZation errors, informal words, unbalanced punctuation and etc. Then, after all that it compares your writing with established standards of word length, sentence length, percentage of passive voice, preposition use, and readability grade level.

So what's it done for me? Nothing short of making my writing better. And the more I write right, the clearer and more concise it gets. Anyway, I'm happy to report that I now write at the 6th grade level (85% on Grammatik's readability index), I almost never write in passive voice (less than 2%), yet I still split lots of infinitives. And I always start too many sentences with and. But that's just my style.

Ken Dickens

Improve Your Writing Or Your Money Back.

Grammatik II found 17 ways to improve this letter in just over one minute. That's only half the battle, and only half of what Grammatik II does. See if you can finish the other half by entering our contest. Just send us a list describing the problems in the circles above. Every 50th entry wins a FREE Grammatik II. And everyone gets a copy of the *World's Shortest Writing Course* just for entering.

PC MAGAZINE

EDITOR'S CHOICE

Enjoy the contest, but here's how you can be a sure winner. Get the writing help you need right now. Call and order Grammatik II today. We guarantee it will improve your writing in 30 days or your money back. For only $89.00, it's the fastest way to get your writing out of the red.

Order Today: (800) 872-9933

CIRCLE 331 ON READER SERVICE CARD

Gram·mat·ik II™

The Writing Analyst

☐ Here's my contest entry, please send me the *World's Shortest Writing Course* FREE ($4.95 value).

☐ Please send me ______ copies of Grammatik II for $89.00 plus $5.00 per unit shipping ($10 per unit outside USA). CA residents add $6.30 sales tax per unit.

I enclose $ ______ ☐ VISA ☐ MC ☐ AMEX

Card # ______ Exp. Date ______

Name ______

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Phone ( ) ______ Word proc. ______

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Reference Software

330 Townsend St., Suite 131, San Francisco, CA 94107. (415) 541-0222 Limit one (1) free World's Shortest Writing Course/Grammatik II per person/address. Contest ends December 31, 1987. Program © Wang Laboratories, Inc. Grammatik II is a trademark of Wang Laboratories. Reference Software is a trademark of Reference Software Inc.

Call for volume World's Shortest Writing Course purchases

Whoops!

Cornucopia Software took the dictionary from its *Electric Webster* and used it to build a combined resident beeper and document checker with the unfortunate name *Whoops!*. This program lets you load its dictionary into memory or leave it on disk, but its vocabulary in either location is much too small. When it checks a screen it beeps at every word it flags, and (like *Turbo Lightning*) it loses the highlighting as soon as you move the cursor. It also had a habit of locking up my computer at inconvenient moments.

■ If you ask for dictionary help, *Whoops!* simply shows you an alphabetical list of words.

If you ask for dictionary help, *Whoops!* simply shows you an alphabetical list of words. Sometimes (not often) it suggests a specific alternative to a misspelled word. You can choose your hot keys with a configuration program, but the menu then continues to show the default keys. (*Turbo Lightning*, by contrast, keeps track of the keys that you actually use.) If you aren't careful to change the "default" word when you ask to check the spelling of a new word, you may end up inserting an earlier word into your file when you want to insert a new one. The program doesn't flag British spellings.

The document checker includes hyphenation help if you want, but overall it has the same limitations as the resident program, and a similarly awkward interface. It flagged all but three of the words in

PC MAGAZINE FACT FILE

***Whoops!*, Version 3.2m**
Cornucopia
Software Inc
P.O. Box 6111
Albany, CA 94706
(415) 528-7000
List Price: $49.95
Requires: 256K RAM, two disk drives, DOS 1.0 or later.

In Short: This inexpensive real-time speller is no bargain, even though it includes a document checker. Too many keystrokes, not enough service. Crashes often. Not copy protected.

CIRCLE **464** ON READER SERVICE CARD

our inclusion test, one of the worst records of any recent program. Even considering its low, $49.95 price tag, *Whoops!* fully lives up to its name.

Windows Spell

No one ever accused *Windows* applications of working too fast. Palantir Software's *Windows Spell* doesn't break that pattern. The program, which uses code supplied by Future Soft and Polyglot, is essentially an unexciting speller that happens to work under *Windows*. You can run it as a background task if you want to check a long document that probably has few mistakes. *Windows Spell*'s progress in the background is displayed by an icon that represents a transparent dictionary gradually filling up with words; the icon flashes when the program comes across a word that needs your attention. You can also call up the program to check a word while working in *Windows Write* or any other *Windows* application. But you have to type in the word you're doubtful about rather than pointing to it with the mouse. Apparently because its search routines are slow, *Windows Spell* doesn't offer alternatives unless it's asked.

I wouldn't buy *Windows* just to run this spelling checker. But if you want to check spelling in the captions in graphics files made with *Windows*-based programs such as *Windows Draw* or *In*a*Vision*, for $79.95, this is your only choice.

PC MAGAZINE FACT FILE

***Windows Spell*, Version 2.0**
Palantir Software
12777 Jones Rd., #100
Houston, TX 77070
(713) 955-8880
List Price: $79.95
Requires: 512K RAM, two disk drives, DOS 2.0 or later, graphics adapter, *Microsoft Windows*.
In Short: If you need a speller written for *Windows*, this is your only choice. Maybe you should just avoid *Windows*. Not copy protected.

CIRCLE **463** ON READER SERVICE CARD

The Word Plus

Back in the ancient realm of CP/M, *The Word Plus* was the king of spellers, and it went on to conquer the DOS world in the early days of the PC. Then Oasis Systems stopped developing it—although the program continues to be sold for a regal list price of $150.

It doesn't make much sense to buy *The*

Word Plus for today's PCs. The distribution disk isn't even double-sided; you have to turn it over to copy the files to your work disk. To use the program on a hard disk, you must cradle it in elaborate batch files that work around its inability to read paths. Its vocabulary is impressive, but the program makes you slog through an interminable series of prompts before you can accomplish anything at all.

PC MAGAZINE FACT FILE

***The Word Plus*, Version 1.21**
Software Heaven Inc.
Oasis Systems
6160 Lusk Blvd., Suite C206
San Diego, CA 92121
(619) 453-5711

List Price: $150

Requires: 64K RAM, one disk drive, DOS 1.1 or later.

In Short: A classic CP/M program, but too cramped and restricted for the DOS world. Some nice utilities included. Not copy protected.

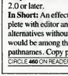
CIRCLE 461 ON READER SERVICE CARD

The package includes a half-dozen separate utilities for inserting hyphens, counting words, replacing strings in text files, and generating anagrams. You can't find some of these features in more-modern programs. Even so, in today's world, *The Word Plus* looks like a king without a country.

Word Proof II

IBM Corp. sells this little $39.95 bargain in its Personally Developed Software series—and the personal developers, William Modlin and David Glickman, have a lot to

PC MAGAZINE FACT FILE



***Word Proof II*, Version 1.0**
IBM Personally Developed Software
P.O. Box 3280
Wallingford, CT 06494
(800) 426-7279

List Price: $39.95

Requires: 128K RAM, one disk drive, DOS 2.0 or later.

In Short: An effective spelling checker complete with editor and thesaurus. If it offered alternatives without making you ask, it would be among the best. Doesn't recognize pathnames. Copy protected.

CIRCLE 460 ON READER SERVICE CARD

PC EDITOR'S CHOICE

- **MicroSpell**
- **Turbo Lightning**
- **WordPerfect**
- **XyWrite III Plus**

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As with all the Personally Developed programs, IBM supplies the manual only on disk. You probably won't need it. And although *Word Proof II* has been around so long that it doesn't recognize paths, IBM thinks it's good enough to use in a new generation of computers. Plans for an OS/2 version have already been announced.

Edward Mendelson is a frequent contributor to PC Magazine.

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PC MAGAZINE PRODUCTIVITY

■ **PC LAB NOTES:** INSTANT SCREENS ■ ETHAN WINER

FAST SCREEN WRITING IN BASIC, PART 1

Adding assembler routines to BASIC, QuickBASIC, and Turbo Basic programs can make your screen displays as fast as those of commercial applications programs.

The usual tip-off that a program was written in BASIC—even compiled BASIC—is its sluggish display speed. While programs such as *1-2-3* provide snappy screen updates, BASIC programs seem to plod along by comparison.

The fault is not in BASIC, however, for the slow video output also affects programs written in most other high-level languages. The real culprits are the video routines built into the PC's BIOS, which BASIC uses, in conformity with IBM's and Microsoft's recommendation. *WordPerfect*, *1-2-3*, and other applications achieve their fast screen output simply by bypassing the BIOS entirely and by using custom routines that write directly to display memory. That's the *only* way to get truly high-performance (and commercially attractive) screen updates.

In this first part of a two-part article I'll show you how you can create instant screen displays. While direct video access requires using assembly language routines to do the real work, it gives you not only professional speed but a number of new capabilities as well. For example, direct video access is the only reasonable way to do windowing, perform horizontal scrolling, or paint new colors on the screen without having to reprint everything. (The techniques for saving and restoring portions of the screen for windowing will be presented in Part 2.)

All of the topics will be shown first using BASIC examples, after which the corresponding assembler code will be presented. Since the way you add assembly language to BASIC differs for each of the popular versions, I'll cover these differences in detail as well. And as you may expect, the major programs—QPRINT.ASM and QPRINT.BAS—are also available for downloading from the PC Magazine Interactive Reader Service. (See the sidebar "QPRINT by Modem.")

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SCREEN MEMORY ORGANIZATION

First, you must understand how the video memory addresses are organized. The first byte in the address space holds the ASCII value for the text character in the upper left corner of the screen, and the second byte contains its color attribute. The third byte represents the second character, the fourth holds its color, and so forth. Color bytes are used on a monochrome monitor as well, to specify intensity, underlining, and flashing.

You can see how this works for yourself by getting into the BASIC interpreter and POKEing in some values directly. Before you POKE anything, however, you must use DEF SEG to establish the correct segment. For a color monitor (CGA or EGA) the segment will be &HB800, and for a monochrome you would instead use &HB000. The following steps, entered in the interpreter's immediate mode, will first clear the screen, then place a capital "A" in the upper left corner, and finally change the "A" to high-intensity white.

```
INSERT 1(17)--4 lines
      DEF SEG = &HB800 '&HB000 for mono
      CLS
      POKE 0, 65
      POKE 1, 15
```

Reading characters from the screen is an important part of windowing and is easy.

```
COLOR  7
LOCATE 1, 1 : PRINT "A"
DEF SEG = &HB800    '&HB000 for mono
X = PEEK(0)         'X = 65
Y = PEEK(1)         'Y = 7
```

These are the simple techniques we will use in assembly language to perform direct screen manipulation.

Determining which video segment to use is simple if you know the type of adapter that is present, but unless you write programs only for yourself, you probably won't know that in advance. Smart programs should be able to figure out what they're connected to by themselves. Let's see how they can do it.

DISPLAY ADAPTERS There are three basic display adapter types in common use: monochrome (including Hercules), CGA, and of course EGA. Text on a monochrome display always uses segment &HB000, and text page zero (the default) for the CGA and EGA is at segment &HB800. Other text pages on the color adapters begin at varying offsets from &HB800, depending on the number of characters per line, and (with an EGA) the number of lines being displayed. Video pages will be discussed in detail in Part 2 of this article; for now let's work with the default page zero.

■ Whenever the display is performing a horizontal retrace, the video signal is disabled, so it is safe to write to screen memory.

Detecting the type of adapter is easy, and merely requires taking a quick PEEK at the BIOS data area in low memory. In BASIC you would do it thus:

```
DEF SEG      = 0
HARDWARE     = PEEK(&H410)
ADAPTER      = HARDWARE AND 48
IF ADAPTER = 48 THEN . . .     'mono
```

The byte stored at address &H410 (1040 decimal) is known as the BIOS equipment list, and essentially reports the setting of the PC's motherboard switches. Besides telling us the type of display adapter, this byte and the one beyond it also contain the number of printer and serial ports connected, whether an 8087 is installed, and so forth. [*For further information on this memory area, see Michael J. Mefford's discussion of STATUS.COM in Volume 6 Number 8—Ed.*] Each item is represented by one or two bits, and the AND instruction is used simply to eliminate the ones we don't care about.

If the fourth and fifth bits are both set to one, then a monochrome adapter is being used. Any other value indicates either a CGA or EGA color monitor. But when a color adapter is present, you can also look to see which bits are set, to determine whether it is currently in a 40- or 80-column mode.

```
DEF SEG      = 0
HARDWARE     = PEEK(&H410)
MODE         = HARDWARE AND 48
IF MODE      = 16 THEN . . .    '40 col
IF MODE      = 32 THEN . . .    '80 col
```

The byte at address 0:410h indicates which display adapter was active when the PC was booted up, and this may subsequently have changed. Further, it does not take multiple monitors into account. To determine the currently active monitor requires checking yet another address in low memory. The word stored at 0:463h is always updated to reflect the current display adapter, even when it has been changed by a MODE command. We only care about the lower byte, though, which will be D4h if a color display is active, or B4h for a monochrome.

Since both the CGA and EGA adapters use the same video segment, it might not seem important to know which is being used. It is, however, for direct screen writing on a CGA will cause "snow" (unsightly interference) if certain precautions are not observed. Quick printing on a CGA cannot be done quite as fast as on a monochrome or EGA adapter, so identifying which color monitor is being used is important.

There are a number of ways to detect the presence of an EGA, but the method I'll use here is to examine yet another byte in low memory. If the byte at address &H487 is not zero, then an EGA is installed.

```
DEF SEG = 0
IF PEEK(&H487) <> 0 THEN . . . 'EGA
```

In *some* cases, the byte at 0:487h may be zero even when an EGA is really installed. With QuickBASIC, we can't call the EGA BIOS routines directly, so looking at 0:487h is the only way to tell if an EGA is present. But in Turbo Basic or assembly language, the best method is to call function 12 of interrupt 10h. If an EGA is active, its BIOS will respond with the EGA status in the BL register. Otherwise, the request will be ignored, since the PC's regular BIOS doesn't know that particular function.

AVOIDING SNOWSTORMS As we've already seen, each character displayed is really in an area of memory that is located on the display adapter circuit board. Sixty times per second the display hardware automatically reads these memory addresses and sends their contents to the scanning beam(s) inside your monitor. But when you ask the 8088 processor to read or write video memory using PEEK, POKE, or assembler instructions, a conflict can result if you and the hardware both attempt to access the same memory at the same time. Since there's no reasonable way to ensure that a POKE will occur only when the display hardware isn't reading the same memory address, the result is unsightly snow on the screen.

Newer adapters like the EGA use a "dual-ported" design, so the synchronization of simultaneous read and write requests can be handled by the hardware automatically. When writing to a CGA display adapter, however, it's up to your program to ensure that the video memory is accessed only during those time periods when it is safe to do so. One way to achieve this is by testing the horizontal retrace bit in the video status port.

A video monitor creates images by repeatedly moving a beam of electrons from left to right across the display screen, dropping the line downward at each sequential scan. At the end of each line the beam is turned off for a brief period, at which time it quickly returns it to the left edge in preparation for drawing the next line. (You can see these "retrace" lines faintly on some monitors if you turn the brightness all the way up.) But the key point is that whenever the display adapter is performing a horizontal retrace, the video signal is disabled, so it is safe to write to screen memory.

One problem is that this retrace period is extremely short (a few microseconds), so there's only enough time to write a sin-

THE 8088 STRING INSTRUCTIONS

The 8088 has several instructions specifically intended for moving strings of bytes or words. Once a few preliminary set-up steps have been performed, copying data from one place to another is a snap. The register pair DS:SI is used to identify the source segment and address, and ES:DI designates the destination.

Normally, bytes and words from memory are loaded into the various registers with the 8088 MOV instruction. For example, MOV AX,12 puts the value 12 into the AX register. To retrieve the value held in *memory location* 12, however, you would instead use MOV AX,[12]. Indirect addressing—where memory locations are used instead of the actual values—is quite common, since the programmer rarely knows what numbers will ultimately be required when a program is written. In practice, the addresses aren't usually known in advance either, so registers are generally used to hold the addresses too.

When a number of bytes or words must be moved, though, this method requires several steps. First, the address where the data is coming from must be determined, as well as where it is to go. Then, as each byte is transferred, both the source and destination address registers must be incremented. That is, if the first byte is to come from address 12 and go to address 15001, the second will come from address 13 and go to 15002, and so forth. The program fragment shown in Figure A illustrates the various steps involved in moving a number of bytes, using the SI and DI registers to show where they are.

```
          Mov  CX,100        'prepare to move 100 bytes
          Mov  SI,12         'source is at address 12
          Mov  DI,15001      'destination is address 15001
Do_Loop:  Mov  AL,[SI]       'move the byte into AL
          Mov  [DI],AL       'and put it into address at DI
          Inc  SI            'point SI to the next address
          Inc  DI            'ditto for DI
          Loop Do_Loop       'do until CX = 0
```

Figure A: *Using MOV to copy data from one location to another.*

```
          Mov  CX,100        'prepare to move 100 bytes
          Mov  SI,12         'source is address 12
          Mov  DI,15001      'destination is address 15001
          Cld                'clear direction flag (forward)
Do_Loop:  Lodsb              'retrieve the byte at address SI
          Stosb              'and put it into address in DI
          Loop Do_Loop       'do until CX = 0
```

Figure B: *Using LODS and STOS to copy data.*

In Figure A, the CX register is first loaded with the number of bytes to copy, and SI and DI are then assigned the appropriate source and destination addresses. The 8088 LOOP instruction serves as an assembler "For/Next" loop, and conveniently jumps to the indicated label CX times. Each time LOOP is encountered in a program, the CX register is decremented automatically, and if it hasn't reached zero, a jump to the label is performed.

What makes LOOP so convenient is the way it decrements CX and does the conditional jump at the same time. In much the same way, the LODS and STOS string instructions will load or store a byte or word, adjusting the source and destination addresses automatically. Since both operations happen simultaneously within the microprocessor, this is not only a simpler and more compact approach, but it is also faster.

LODS and STOS each take a byte or word argument, to indicate the size of the data being moved. The AX register is always used, though when a byte is being considered, only AL, the lower half of the register, is used. LODSB loads a string byte into AL from the address contained in SI, and then automatically increments SI by one. STOSW, on the other hand, stores the word held in AX at the address pointed to by DI, and then increments DI by two.

In actual practice, however, the registers aren't always incremented. Depending on the setting of the direction flag, they may instead be decremented. Though it usually doesn't matter whether a series of bytes are copied forward or backwards, it will make a difference if the memory addresses overlap. Figure B shows the same string move that was performed in Figure A using the more efficient string commands.

There's an even simpler way to move lots of data around, by using the REP (repeat) instruction prefix. Rather than create an explicit loop as shown in the figures, REP MOVSB or MOVSW will move the number of bytes or words specified in CX automatically, without any additional intervention. However, this would not be appropriate when writing to video RAM, because there would be no chance to test for the horizontal retrace. Once the REP command is given, the processor will move the entire block without pausing.—**Ethan Winer**

gle byte or word. On the other hand, however, the retrace happens so frequently that even if you have to wait for it prior to printing each character, this method will still be much faster than using the BIOS. The BIOS itself uses a similar approach and also waits for retrace, of course, but the BIOS is slowed down by the enormous additional overhead it must carry. Let's see what that entails.

BIOS BAGGAGE Each time you call a BIOS video routine, it must first look to see which of its many services you have requested. Once the BIOS knows that you are asking to print a character, it has to determine which type of adapter is present. If it's a color adapter, it also has to see whether it is currently in the text mode, and if so, it must check whether the width is 40 columns or 80. Next, it has to find where the cursor is presently located, so it can calculate the address to write to. Only then can it begin looking for the horizontal retrace. All of this is done each and every time the BIOS displays a character. No wonder it's so slow! Since we simply want to print a single string in a known place on the screen, all of the additional work can be done ahead of time. The source and destination segments and addresses can be determined once, and then a simple loop can perform the retrace test and video write operations. To determine when the display is doing a retrace merely requires reading the CGA status register, as shown in Figure 1.

Notice how two loops are required to ensure that the retrace period has just begun. The first loop waits until a retrace is NOT occurring, and the second one waits until it is. If we simply looked to see if the display was doing a retrace and then stored the character, we might hit periods when the retrace was nearly finished. This extra step ensures that the entire retrace period will be available.

There is also a vertical retrace period, and it lasts much longer than the horizontal one (about 17 milliseconds). In fact, you can store an entire line of characters or more during the vertical retrace, though the exact number varies with the speed of the PC. If you can be certain that the text to be displayed will never exceed, say, 80 characters or so, then you might consider this approach instead. The vertical retrace bit is tested by ANDing the video status byte with an 8 instead of a 1.

QUICK PRINTING IN BASIC With this understanding of video fundamentals, let's now look at how to print strings quickly in BASIC. Two factors need to be addressed here: locating the strings to be printed, and adding the assembly language routine to a BASIC program. The approach required for the BASIC interpreter is very different from that needed for QuickBASIC, which in turn is quite different from Turbo Basic. Turbo Basic does not use the BIOS for printing, and is therefore considerably faster than the other languages. However, we can still improve on Turbo's speed.

```
             Mov  DX, 3DAh        ;specify port 3DAh

No_Retrace:  In   AL, DX          ;get input from the port into AL
             Test AL, 1           ;test the retrace bit
             JNZ  No_Retrace      ;doing a retrace, wait until done

Retrace:     In   AL, DX          ;input from the port
             Test AL, 1           ;test the bit
             JZ   Retrace         ;not doing a retrace, wait

             Movsb                ;move the character from BASIC
                                  ;  to screen memory
```

Figure 1: *Using the 8088 IN instruction to determine when a display adapter is performing a horizontal retrace.*

```
Test$ = "This is a test message."
Locate 10, 1

Row = CsrLin                    'find the cursor location
Col = Pos(0)
Row = Row - 1                   'adjust 1-25 to 0-24
Col = Col - 1                   'adjust 1-80 to 0-79

Address = Row * 160             'calculate start address of row
Address = Address + (2 * Col)   'add offset for column

Def Seg = 0                     'look at video controller port in
Adapter = Peek(&H463)           '  low memory
If Adapter = &HB4 Then          'set the segment accordingly
   Def Seg = &HB000             'mono
Else
   Def Seg = &HB800             'color
End If

For X = 1 To Len(Test$)         'for each character in the string
    Temp = Asc(Mid$(Test$. X))  'get its ASCII value
    Poke Address + (X*2), Temp  'poke it to the character address
Next
```

Figure 2: *A BASIC model for the assembler Quick Print routine.*

We'll discuss the BASICA method first, and then cover adapting the routines to the two compilers. Bear in mind that in addition to increasing screen speed, direct video access means that *all* the available characters can be displayed. For example, attempting to print the CHR$(12) female symbol normally causes the BIOS to clear the screen. Similarly, the CHR$(29) double arrows backspace the cursor. By POKEing directly into screen memory instead, however, the entire character set can be utilized.

All three versions of BASIC maintain a table of descriptors that hold the length and address of each string you assign. Strings in BASICA are limited to 255 characters, because a single byte is used to indicate its length. When you call an assembler routine in BASIC with a string argument, the offset of its descriptor in BASIC's data segment is placed on the processor's stack. Once an assembler routine knows where the descriptor is, it can determine where the string data is located and how many characters it contains.

A BASIC model of the assembler Quick Print routine, including all the steps needed to locate strings and determine the type of adapter, is shown in Figure 2. Instead of waiting for the horizontal retrace period, though, this example merely POKES the characters to the display. To minimize the number of passed parameters in the assembler implementation, we'll instead begin printing at the current cursor location. Besides being simpler, it is also closer to the way printing in BASIC is usually done.

In the Figure 2 example, the string to be printed is first assigned, and then Locate is used to specify where it will go. Next, CsrLin and Pos(0) are used to determine where we just positioned the cursor. Since screen memory uses address zero (rather

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than one, as in BASIC) to indicate the upper left corner, we must adjust the row and column ranges by subtracting 1 from each of them.

For each row on the screen, 160 bytes are needed, as there are 80 character bytes and 80 attribute bytes in each row. Once the starting address of the specified row is known, the final address can be determined by adding twice the column number. Again, all of the calculations must be doubled to accommodate the attribute bytes.

The next step is to determine the display adapter type in use, so we can specify the correct video segment. Finally, a For/Next loop steps through each character in the string and POKES it into the character addresses on the screen. Since this example skips over each attribute byte, whatever color is already there will be left undisturbed. The assembler implementation of this routine, shown in the QPRINT.ASM listing, does accept a color argument; the point here is simply to present the concept.

Like the BASIC model shown in Figure 2, QPRINT.ASM begins by asking the BIOS to report the current cursor position. This is done by requesting service 3 of interrupt 10h, which returns with DH holding the row (0–24) and DL holding the column (0–79). Next, using the 8088's multiply instruction, the actual starting address is calculated. This value is then put in the DI register. The 8088 has several instructions specifically intended for loading and storing strings, and DI will indicate the destination address.

Once the starting screen address is known, we need to see what type of monitor is connected. First the byte at address &H410 is examined to find which segment to use, and if it is color, then the byte at &H487 is examined to tell whether it's a CGA or EGA adapter. If a CGA is installed, then the DX register is loaded with the number of the video status port that will be checked for retrace just prior to printing each character. Otherwise, DX is left set to zero, which also serves as a flag later to indicate that the retrace check is not needed.

The final steps retrieve the addresses for the variables that were passed from BASIC and then create a loop to place the characters onto the screen. Notice the trick by which a single byte is obtained from the string but an entire *word* is then stored on the screen. By placing the attribute once into the AH register, it can be used repeatedly for each character in the string. (This is further discussed in the sidebar "The 8088 String Instructions.")

Notice, too, that a fake header must be created to fool BASIC into thinking the program has actually been BSAVEd. Unlike QuickBASIC and most of the other high-level languages, the BASIC interpreter provides no facilities for linking assembly language routines. That means that one or more devious methods must be employed. In this case I chose to design the routine to be BLOADed into an integer array. The only problem is that you can't just BLOAD anything. When BASIC BSAVEs a portion of memory for later loading, it places a 7-byte header at the beginning of the file.

The first byte of the header always has the value &HFD, which merely identifies it as a binary image file for BASIC. The next two bytes indicate from which segment it had originally been saved, while the following two bytes identify the original address within that segment. The remaining two bytes hold the file's length, which we are having the assembler calculate for us. It has never been clear to me why the segment is included in the file, since that information is never used. Nonetheless, all of this information must be present in the header.

QPRINT ASM AND BAS You can use any ASCII text editor to create the source code for QPRINT or download it from the PC-IRS. You assemble it with the IBM or

```
;QPRINT.ASM - performs Quick Printing in the BASIC interpreter

;Note: Assemble this with MASM (2.0 or later), then LINK, finally EXE2BIN


Code         Segment Byte
             Assume  CS:Code

QPrint       Proc    Far
Start_Addr   Equu    0                 ;identify the program's starting address

Begin:       DB      0FDh              ;fake the header BASIC uses for BLOAD
             DW      0, 0              ;phony segment and address
             DW      End_Addr - Start_Addr    ;calculate this program's length

             Push    BP                ;save registers for BASIC
             Push    ES

             Mov     AH,3              ;specify BIOS service to read cursor position
             Mov     BH,0              ;on text page zero
             Int     10h               ;this service returns row/column in DH/DL

             Mov     AL,DH             ;put the current row number into AL
             Mov     CL,160            ;multiply by 160 to get start address of row
             Mul     CL                ;do the multiplication, answer ends up in AX
             Mov     DH,0              ;clear DH for the Add below, we only want DL
             Add     AX,DX             ;add the column once for the character byte
             Add     AX,DX             ;and once more for the attribute byte
             Mov     DI,AX             ;now DI holds starting address on the screen

             Xor     DX,DX             ;zero out DX to look at low memory using ES
             Mov     ES,DX
             Mov     BX,0B000h         ;assume the mono screen segment for now
             Mov     AL,ES:[463h]      ;look at the video controller port address
             Cmp     AL,0B4h           ;is it mono?
             JZ      Get_Params        ;yes, skip over adding 800h to video segment
             Add     BX,800h           ;no, adjust BX for a color monitor
             Push    BX                ;and save it because the EGA test destroys BX

             Mov     AH,12h            ;specify EGA BIOS EGA special function service
             Mov     BL,10h            ;request EGA info
             Int     10h               ;call the BIOS
             Cmp     BL,10h            ;if BL is still 10h, there's no EGA
             JNZ     EGA               ;it is an EGA, skip ahead
             Mov     DX,3DAh           ;not EGA, specify port to check for retrace

EGA:         Pop     BX                ;get the video segment again
Get_Params:  Mov     BP,SP             ;get stack pointer so we can find variables
             Mov     ES,BX             ;move whatever segment is correct into ES

             Mov     SI,[BP+08]        ;get the color that was passed
             Mov     AH,[SI]           ;and put it into AH for screen writing below
             Mov     SI,[BP+10]        ;put descriptor to X$ into SI
             Mov     CL,[SI]           ;put Len(X$) into CL for loop counter
             Mov     CH,0              ;clear out CH
             JCXZ    Exit              ;if CX is zero it's a null string, exit now
             Mov     SI,[SI+01]        ;put address of first character in X$ into SI
             Cld                       ;clear the direction flag to move data forward

Check_Mon:   Cmp     DL,0              ;are we on a mono or EGA system?
             JZ      Mono              ;yes, skip over the retrace stuff

No_Retrace:  In      AL,DX             ;get the video status byte from port number DX
             Test    AL,1              ;test just the horizontal retrace bit
             JNZ     No_Retrace        ;if doing a retrace, wait until it's not

Retrace:     In      AL,DX             ;get the status byte again
             Test    AL,1              ;are we doing a retrace now?
             JZ      Retrace           ;no, wait until we are

Mono:        Lodsb                     ;get the character from X$ and increment SI
             Stosw                     ;store both the character and attribute
             Loop    Check_Mon         ;loop until CX is zero

Exit:        Pop     ES                ;restore the registers for BASIC
             Pop     BP
             Ret     4                 ;return skipping the passed parameters

End_Addr     Equ     $                 ;identify this program's ending address
QPrint       Endp
Code         Ends
             End     Begin
```

QPRINT.ASM: *The assembler source code for QPRINT.*

Microsoft Macro Assembler (Version 2.0 or later). The resulting object module must then be linked, and finally EXE2BIN must be used to convert it into a binary format suitable for BLOADing. [*Note that you do* not *use EXE2BIN to produce a .COM file, as is customary in this column. Give the command*

```
EXE2BIN QPRINT QPRINT.BIN
```

instead—Ed.] Ignore the warning message LINK issues about not having a stack segment—it doesn't matter in this particular case.

The corresponding QPRINT.BAS listing shows the final BASIC program that demonstrates how to load and call QPRINT. In preparation for loading the binary program, an integer array is dimensioned to 50 elements. Since each array element comprises two bytes, 50 (along with element zero) will be enough to hold the 110-byte file. The first seven bytes comprise the header I mentioned previously. This header will be stripped off by BASIC when QPRINT is BLOADed.

Next, the program ensures that BASIC's current segment is its default one, so there won't be any "surprises" when the routine is BLOADed. If no DEF SEG statements have been executed since BASIC was started, then this step isn't really needed, but why take chances? If a file is loaded into the wrong segment in memory, a crashed system or corrupted data is the most likely result.

Finally, the address of the first element in the array is located with VARPTR, so the BASIC program knows the address to specify when the binary disk file is loaded. Once that address has been determined, the routine can be called. Notice that two parameters are specified when calling QPRINT. The first identifies which string is to be printed, and the second specifies the color to use when printing it.

Unlike BASIC's method, in which the foreground and background colors are indicated separately, only a single byte is needed to include both colors here. This is illustrated in the diagram "The Video Attribute Byte." The AND and multiply instructions are used to mask off the relevant bits in each portion of the color attribute byte and place the bits in their correct position. (For further discussion of this technique, see the accompanying sidebar "AND and OR in BASIC.")

```
10 'QPrint.Bas - quick print demonstration
20 '
30 TEST$ = "This is a test message."        'define the string to print
40 COLR% = 112                              'color 112 is black on white
50 QPRINT = 0                               'define before dimensioning array
60 DIM ARRAY%(51)                           'set aside room to hold the code
70 '
80 DEF SEG                                  'insure BASIC's default data segment
90 QPRINT = VARPTR(ARRAY%(0))               'find where the array starts
100 BLOAD "QPrint.Bin", QPRINT              'load assembler code into the array
110 '
120 LOCATE 10,1                             'specify where to print it
130 CALL QPRINT(TEST$, COLR%)               'call QPrint
```

QPRINT.BAS: *A BASIC program that shows how to load and call the assembly language routine.*

One important warning whenever you intend to call a routine that is contained in an array is that the location of the array will probably change during the course of the program. BASIC is very tidy and organized with its handling of variables, and it keeps all of the regular variables apart from the arrays. Even if an array has already been dimensioned, assigning a new nonarray variable will cause any existing arrays to be slid upward in memory to make room. Therefore, you must be sure to obtain the array's address immediately prior to BLOADing the routine, and again each time the routine is called. This is why the variable QPRINT is assigned earlier in the program.

ADAPTING TO BASIC COMPILERS

Now let's consider the changes needed to convert QPRINT for use with QuickBASIC and Turbo Basic. Fewer changes are required with QB, so we'll look at that first. All of the topics I'll discuss regarding QuickBASIC apply to any of its versions, including 3.0 and even the earlier BASCOM compilers.

The first step is to remove the BSAVE header information; we won't be using that method here. Therefore, delete the following lines from the beginning of the program:

```
DB  0FDh
DW  0, 0
DW  End_Addr - Start_Addr
```

The starting and ending address markers

QPRINT BY MODEM

The programs published in *PC Magazine* can be downloaded by modem from the PC Magazine Interactive Reader Service. There is no charge for this service, but users are cautioned that these programs are copyright material and are made available only for individual, noncommercial use. You may make copies for others (including placement on noncommercial electronic bulletin boards), as long as no charge is involved. However, making copies for any commercial purpose is strictly prohibited.

The modem number for PC-IRS is (212) 696-0360. Set your modem and communications software to use 1200 (or 300) bps, 8 data bits, 1 stop bit, no parity. Files with a .COM, .EXE, or .ARC extension require that you also use the Xmodem error-checking protocol; files with .ASM or .BAS extensions can be downloaded using either regular ASCII or Xmodem.

If you use the Xmodem protocol, you can download QPRINT.BIN directly. QPRINT.BAS, also available for download, is a separate program, as discussed in the accompanying article. QPRINT .ASM, also listed both there and on PC-IRS, requires you to use a macro assembler (IBM or Microsoft, Version 2.0 or later) and the following commands:

```
MASM QPRINT;
LINK QPRINT;
EXE2BIN QPRINT QPRINT.BIN
```

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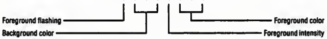
The Video Attribute Byte



ColorByte% = (FG And &H0F) + (BG * &H10) + 8 * (FG And &H10)

Organization of the bits in a video attribute byte.

won't affect the program, so you can either leave them in or remove them—it really doesn't matter.

Only two other changes are needed, and the first is to add a PUBLIC declaration so LINK or BUILDLIB will be able to make the routine available by name in your BASIC program. To do this, you must modify the first few lines of the program so that they appear as below:

```
Code     Segment Byte Public 'Code'
         Assume  CS:Code
         Public  QPrint

Begin:   Push BP
```

The second change alters the program's reference to the string descriptor, because compiled BASIC allows strings to be as long as 32,767 characters. Just beyond the label Get_Params are instructions to get the length and address of the string. Change these as shown below to accommodate the extra descriptor byte. Then, once the program has been assembled, the resultant object module will be ready for linking with a main BASIC program, or for inclusion in a QuickBASIC user library.

```
Mov  CX,[SI]         ;was CL,[SI]
XOR  CH,CH           ;remove this line
JCXZ Exit            ;leave as is
Mov  SI,[SI+02]      ;was [SI+01]
```

You could also remove the PUSH ES and POP ES at the beginning and end of the assembler listing if you'd like, but it doesn't really hurt anything to leave those instructions in. Unlike BASICA and GW-BASIC, QuickBASIC doesn't require this register to be preserved.

As you can see in Figure 3, the QuickBASIC demo program for QPRINT is considerably simpler than the interpreter version.

TYING IN TO TURBO Adapting QPRINT to Turbo Basic is slightly more difficult, for Turbo passes variable addresses on the stack in a way different from that of QuickBASIC or the interpreter. Since we're not going to link the assembly language routine to Turbo Basic, the PUBLIC declaration is not needed, and removing the BSAVE header is essential. But the real changes center around retrieving the string to print and its color.

■ Strings in the Microsoft BASICs are always located in the same default data segment.

Strings in the Microsoft BASICs are always located in the same default data segment used by the rest of the program variables, so no extra steps are needed to find them. But in Turbo Basic, not only are strings located in a different place from regular numeric variables, but chances are good that neither of them are in the default segment. Besides the extra work of finding them, we'll also have to load the DS register separately for each variable.

The 8088 provides a very useful instruction, LDS, for accessing variables that are passed as two words. Since we need to get not only the address but also the segment for Turbo's variables, LDS can do this for us in one shot. But since we're going to change the DS register, we must preserve it first. While neither compiled BASIC requires the ES register to be saved, DS is another matter entirely. This means that when we're converting the interpreter version of QPRINT over to Turbo Basic, the PUSH ES and POP ES pair must be replaced with PUSH DS and POP DS, rather than being removed, as we did with QuickBASIC. Replace the section between the Get_Params and Check_Mon labels to reflect the following changes:

```
Get_Params: Mov   BP,SP
            Mov   ES,BX
            LDS   SI,[BP+08]
            Mov   AH,[SI]
            LDS   SI,[BP+12]
            Mov   CX,[SI]
            And   CX,7FFFh
            Mov   SI,[SI+02]
            JCXZ  Exit
            Pop   DS
            Push  DS
            Mov   DS,DS:[0000]
            Cld
Check_Mon:  Cmp   DL,0
```

Besides having to get both the segment and address for each variable, we must also find where the actual string data is located. In fact, Turbo Basic requires us to juggle *five* different segments. The color variable is contained in one segment, the string descriptor in another, and the string data in yet a third. Further, to find the string data segment means looking in Turbo's default segment (MOV DS,DS:[0000]). And, of course, as we saw at the outset, the program also had to retrieve the screen memory segment.

Yet another added complication is the fact that the length word in a Turbo string descriptor may have the high bit set, so an AND instruction is required to determine its true length. The final change is the removal of the assembler RET instruction. Normally, to keep the stack straight, it is up to the programmer of an assembly language routine to specify how many variables had been passed to it when he gives the RET instruction. In Turbo Basic, though, this is done automatically for you.

Once the appropriate modifications have been made to the QPRINT assembler source, you will compile it, link it, and then use EXE2BIN as with the interpreter. However, the resultant binary file will not be BLOADed. Instead, it will be combined, using Turbo's $Inline metastatement. $Inline has two different uses in Turbo Basic; here we'll use the subprogram method, which is really just a variant on $Include.

Unlike subprograms written in BASIC,

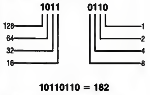
AND and OR in BASIC

One of BASIC's most confusing capabilities is the way it can manipulate individual bits in a byte or word. Even experienced programmers often have a difficult time grasping exactly how the so-called "logical" instructions, such as AND and OR, operate and how to use them. Unlike the normal tests programmers use to determine if a given condition is true or not, bit-wise manipulations operate only on a portion of an integer byte or word.

I won't get into a lengthy discussion of binary number theory here, and the diagram "Bit Values in a Byte" illustrates only the rudiments of how a binary number is represented. Here, each bit in the byte has a certain value, and the byte's total value is determined by simply adding each of the individual bit values. For example, this byte has a value of 182, which is derived by adding the value associated with each of the bits that are set to one. That is, 182 equals 128 + 32 + 16 + 4 + 2.

Where AND and OR come in handy is when you need to test if a particular bit or group of bits happens to be turned on. True, you can always test whether the "1" bit is set by simply checking if the byte is odd or even. It can only be odd if the lowest bit is set, or active. But that approach won't help when we need to know if the "16" bit is on?

Bit Values in a Byte



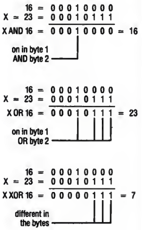
Determining a byte's decimal value by adding the values of each of the active bits.

Whenever you use the AND instruction in BASIC (or any language, for that matter), *two* bytes are actually being compared. Each of the bits in the first byte is compared with the corresponding bit in the second, and the resultant value has a "one" in that position only if both were set. That is, if bit *x* is on in the first byte *and* it's also turned on in the second, then the result byte will have bit *x* set to indicate this.

OR works in a similar manner, except the output bit will be set if bit *x* is active in either byte 1 *or* byte 2. Other available bit operations are NOT, which simply turns all one bits to zero and all zero bits to one, and XOR (Exclusive OR) which results in a one only when the two bits being compared are *different*.

Logical Operations on Bits

How AND, OR, and XOR affect the bits within a byte, and how they add them up in the binary and decimal number systems.



Therefore, to determine if, say, the 16 bit is active in the variable *x*, you would AND *x* with 16 and then see if the result is either zero or 16, as shown in the diagram "Logical Operations on Bits."

—Ethan Winer

the variables being passed are not declared in an assembler procedure. Instead, either a list of bytes may be entered (a chore to avoid!), or the name of a binary file that contains the bytes may be specified. So, add the subprogram below to the end of the BASIC program in Figure 3.

```
Sub QPrint Inline
    $Inline "QPRINT.BIN"
End Sub
```

```
'QPrint.Bas - QuickBASIC version

Test$ = String$(20 * 80, "X")          'make a long test string
Colr% = 7
Locate 1, 1
Call QPrint(Test$, Colr)
```

Figure 3: *QuickBASIC allows calling an assembler routine by name.*

Also, because Turbo Basic does its own printing, it doesn't bother to update the BIOS cursor position when you use Locate unless the cursor is turned on. But since the first thing QPRINT does is to ask the BIOS where the cursor is, you must force the cursor on when you Locate it, thus:

```
Locate X, Y, 1
```

In this first installment I've covered what is involved in accessing video memory directly for the purposes of quick printing. Saving and restoring selected portions of the screen to perform windowing will be discussed in the second part of this article.

Ethan Winer is a contributing editor of PC Magazine.

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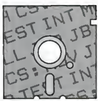

Here's a way to ease the task of keeping track of names, addresses, and phone numbers and to ring up your quarry at the touch of a key.

If you're forever losing phone numbers, or you jot down names and addresses on the backs of envelopes that mysteriously disappear, CARDFILE may be the solution to your problem. In one resident utility you get a pop-up name, address, and phone number database you can search faster than a speeding Rolodex and even use as an auto-dialer for your Hayes-compatible modem.

You can use that modem to good advantage by downloading CARDFILE .COM from the PC Magazine Interactive Reader Service, as explained in the "CARDFILE by Modem" sidebar. The source code (CARDFILE.ASM) and a BASIC program (CARDFILE.BAS) that will generate CARDFILE.COM for you, if you don't have an assembler, are listed here and are also available via PC-IRS.

To execute the program, you simply enter

```
CARDFILE [d:][filespec]
```

where *filespec* is an optional parameter that specifies the name of a data file for the program to use. As with most memory-residents, the most convenient way to load the utility is through your AUTOEXEC .BAT file.

The very first time you run CARDFILE, of course, you won't have a data file to load, so just omit the optional file specifier string. You can then create all the records you want—up to the limit of 255—inside the CARDFILE window and save them to disk, where they can be recalled at a moment's notice.

Once CARDFILE is installed, you can replace one data file with another by invoking the program again from the command line and giving it a new file specifier. The utility recognizes the fact that a copy of its code is already resident and, rather than install itself a second time, it loads the contents of the data file into the data space of the original program. If you don't enter a filename, CARDFILE's data buffer will be cleared. You'll be starting from scratch just as if you had deleted every card.

Pressing Alt-Right Shift pops up the CARDFILE window. If a data file was loaded, you'll see the first record displayed; if no filename was specified on the command line, the window's record space will be blank. A menu line at the bottom of the window spells out your options at all times. Press Esc to close the window and drop you back into the application you left.

■ If you're forever jotting down names and addresses on the backs of envelopes that mysteriously disappear, CARDFILE may be the solution.

Inside the CARDFILE window, the function keys labeled F1 through F6 are assigned the following set of meanings:

F1–Create a new card
F2–Edit the card currently displayed
F3–Delete the card currently displayed
F4–Search all cards for a text string
F5–Save data to disk
F6–Dial the phone number currently displayed

Pressing F1 clears the window and sets the cursor to the first line of the new card. All typing is done in overstrike mode, and the Backspace key can be used in editing. Pressing Enter moves the cursor down a line and back to the beginning. The four cursor keys may be used to move the cursor anywhere within the record area. Pressing F1 a second time signals CARDFILE that the new entry is complete. The new card is inserted alphabetically among the rest, with the text entered in the NAME field used to determine its relative position. To maintain order, you'll want to enter names in a last-name-first fashion.

You can page through all of the cards with the PgUp, PgDn, and Enter keys. PgDn and Enter flip to the next card, while PgUp turns to the preceding one. The HOME and END keys let you jump quickly to the first or last card, respectively. The cards are arranged in a circular queue that lets you wrap around from the last card to the first and vice versa.

You can make changes to an existing card by paging to it and pressing F2. The cursor positions itself on the first line, and the same keys used in creating a card are active again. F1 makes the changes official and drops you out of edit mode.

Deleting a card is as simple as bringing it to the front and pressing F3. CARDFILE asks for verification to make sure F3 wasn't struck by accident. If you change your mind while creating a new card, you can either press F1 to finalize it and then delete it with F3, or simply delete all text (or overwrite it with spaces) on the card before pressing F1. Since CARDFILE stores records away in alphabetical order, it won't let you insert a card entirely devoid of text into the stack.

LOOKING UP CARDFILE offers two ways to search for a particular record or set of records. The first is to press F4 and then enter a text string. CARDFILE will display every card that contains the string, pausing at each one until you press Enter to proceed to the next one or Esc to terminate the search. Thus, if you wanted to flip through all of your phone numbers for Microsoft personnel, you could specify "Microsoft" or "Micro" or any other substring to serve as the object of the search. The search process is not case-sensitive: you could just as easily look for an occurrence of the three letters "IBM" by specifying "ibm" or "iBM" as you could by entering all caps.

The second search feature lets you quickly page to any point in the alphabet. Just press the corresponding character key shifted by the Alt key. To quickly find a listing for "Smith," for example, you'd press Alt-S. If there are other names beginning with *S* that occur before Smith, you're only a short hop away with the PgDn or Enter key. If there are no entries beginning with *S*, CARDFILE will stop at the next card.

Function key F5 activates CARDFILE's save feature. Every card in the file is written to disk under the filename you specified on the command line. CARDFILE remembers the path to the filename it read during initialization and saves the new data back to the same drive and directory.

When you start CARDFILE from scratch, without an input file, you'll be prompted to enter a filespec the first time you press F5. Enter the full pathname along with the filename. In this case, CARDFILE doesn't construct a full file specification complete with drive and directory as it does when it parses a filename entered on the command line. Subsequent saves will automatically use the filespec you enter.

If for some reason CARDFILE cannot save the file with the filespec you designate, it will ask for a new one. One way to induce such a response is to delete the directory from which CARDFILE read the input file. DOS will then reject CARDFILE's next attempt to open the file for a save, since the once-legitimate pathname is no longer valid. When confronted with this situation, you can either enter a new filespec and let CARDFILE save the file to another area or press Esc to retain the old one. The latter option is handy if, for instance, you were saving to drive A: but forgot to insert a floppy. Rather than entering a new filespec, you would probably choose to retain the old one, put in a disk, and try again.

■ One of CARDFILE's real conveniences is its auto-dial capability. If your modem understands the Hayes command set, pressing F6 will dial the number displayed.

When CARDFILE encounters an error condition of any kind, it notifies you with a message on the menu line at the bottom of the window. If, for example, you attempt to dial a phone number with your modem powered off, CARDFILE will respond with "Modem not ready." You must acknowledge all error messages by pressing the Esc key.

One word of warning concerning CARDFILE and DOS 2.*x*: to keep an already long utility from growing longer, CARDFILE implements a very simple critical error handler that only works reliably under DOS 3.*x*. If you accidentally attempt to save the data file to an empty drive with an old version of DOS (or do anything else to cause a critical error, for example, attempt to write data to a write-protected disk), your system may crash or mistakenly inform you that the disk is full. Be careful when it comes time to save your CARDFILE data if you're still using DOS 2.0 or 2.1.

AUTO-DIALING One of CARDFILE's real conveniences is its auto-dial capability. If your modem understands the Hayes command set (more specifically, the Hayes dial and hangup instructions), pressing F6 will dial the number currently displayed in the PHONE field. When dialing is complete, the program prompts you to pick up the telephone and press the Spacebar. Pressing the Spacebar breaks the modem connection, leaving your telephone handset in control of the line.

Phone numbers may include numerals, parentheses, dashes, slashes, and even text if you like. With one exception, every nonnumeric character is ignored by CARDFILE's dialing routine. The exception is the comma. Most Hayes users know that the comma is a signal to the modem to pause in its dialing sequence for an amount of time determined by the setting of the internal S8 register. The default is 1 second. You can insert pauses by placing one or more commas between digits in a phone number. This is useful in phone installations that require you to dial a single-digit access number and wait for a tone before dialing through the primary network.

Remember to include all the digits required to dial the phone number manually, including leading 1's for long distance. Assuming you have to dial 9 to get out, then pause momentarily for a dial tone, the following is a sample of how the PHONE line might look on a card for getting New York City directory assistance:

```
9 ,, 1 (212) 555-1212
```

The dial function ignores the parentheses, the dash, and the spaces between characters.

Although CARDFILE goes out of its way to make the dialing process automatic, the fact that it is a TSR program presents some inherent limitations. A nonresident dialer would precede a dial command

```
;CARDFILE.COM for the IBM Personal Computer - 1987 by Jeff Prosise
;
bios_data       segment at 40h
rs232_base      dw 4 dup (?)                    ;UART base addresses
                org 4Ah
crt_cols        dw ?                            ;number of display columns
                org 4Eh
crt_start       dw ?                            ;video page offset address
                org 63h
addr_6845       dw ?                            ;CRTC base address
                org 87h
infobyte        label word
ega_info        db ?                            ;EGA info byte
bios_data       ends
;
code            segment para public 'code'
                assume cs:code
                org 100h
begin:          jmp initl                       ;goto initialization code
;
program                 db "Cardfile 1.0 "
copyright               db "(c) 1987 Ziff Communications Co.",13,10
                        db "Hotkey is ALT-RIGHT SHIFT$",1Ah
author                  db "Jeff Prosise"
;
dos_segment             dw ?                    ;segment of internal DOS flags
indos_offset            dw ?                    ;offset of INDOS flag
errflag_offset          dw ?                    ;offset of critical error flag
program_status          db 0                    ;popup status
flag_10h                db 0                    ;status of interrupt 10h
flag_13h                db 0                    ;status of interrupt 13h
request_flag            db 0                    ;status of processing request
ss_register             dw ?                    ;SS register storage
sp_register             dw ?                    ;SP register storage
oldpsp                  dw ?                    ;PSP segment storage
;
maxrec                  db 250                  ;maximum number of records
recptr                  db 1                    ;current record number
numrec                  db 0                    ;number of records
adapter                 db ?                    ;0=MDA, 1=CGA, 2=EGA
video_segment           dw ?                    ;video segment address
border_attr             db ?                    ;window border attribute
text_attr               db ?                    ;window text attribute
menu_attr               db ?                    ;menu line attribute
record_attr             db ?                    ;record display attribute
video_page              db ?                    ;current video page
cursor_mode             dw ?                    ;cursor shape
cursor_pos              dw ?                    ;cursor position
cursor_addr             dw ?                    ;cursor CRTC address
new_cursor              dw ?                    ;Cardfile cursor shape
dos_version             db ?                    ;DOS version number
slotno                  db ?                    ;record position
reload                  db ?                    ;reload data file flag
zflag                   db ?                    ;critical error flag change status
fileflag                db 0                    ;filespec validity indicator
record_length           db 102                  ;record length in bytes
;
comport                 dw 0                    ;COM1
initstr                 db 10000011b            ;1200 baud, N81 data format
dialstr                 db "ATDT",0             ;Hayes Smartmodem dial string
hangupstr               db "ATH0",13,0          ;Hayes Smartmodem hangup string
;
jump_table              dw offset creatn            ;vector dispatch table
                        dw offset edit
                        dw offset delete
                        dw offset search
                        dw offset save
                        dw offset dial
;
titles                  db 32,"Name",32,32,"Addr",14 dup (32),"Phone",32,"Note",32
menuline1               db "F1-New F2-Ed F3-Del F4-Sch F5-Sv F6-Dial",0
menuline2               db "Press ENTER to delete, ESC to abort",0
menuline3               db "Press F1 to validate new entry",0
menuline4               db "Find:",0
menuline5               db "Press ENTER to continue, ESC to end",0
menuline6               db "Search key not found. Press ESC",0
menuline7               db "No room for additional records",0
menuline8               db "Disk full",0
menuline9               db "Press F1 to validate changes",0
menuline10              db "Pick up phone and press spacebar",0
menuline11              db "Error saving file",0
menuline12              db "Modem not ready",0
menuline13              db "File:",0
;
timer_int               label dword             ;old interrupt 8 vector
old8h                   dw 2 dup (?)
keyboard_int            label dword             ;old interrupt 9 vector
old9h                   dw 2 dup (?)
video_int               label dword             ;old interrupt 10h vector
old10h                  dw 2 dup (?)
bdisk_int               label dword             ;old interrupt 13h vector
old13h                  dw 2 dup (?)
bp_int                  label dword             ;old interrupt 28h vector
old28h                  dw 2 dup (?)
;
old1Bh_segment          dw ?                    ;old interrupt 1Bh segment
old1Bh_offset           dw ?                    ;old interrupt 1Bh offset
old23h_segment          dw ?                    ;old interrupt 23h segment
old23h_offset           dw ?                    ;old interrupt 23h offset
old24h_segment          dw ?                    ;old interrupt 24h segment
old24h_offset           dw ?                    ;old interrupt 24h offset
;
color_attr              db 0,0B0h,1Fh,0Eh,0Eh,0Fh
mono_attr               db 0,000h,70h,07h,07h,07h
enable_values           db 2Ch,28h,2Dh,29h,2Ah,2Eh,1Eh
key_table               db "QWERTYUIOP",0,0,0,0
                        db "ASDFGHJKL",0,0,0,0,0
                        db "ZXCVBNM"
;-----------------------------------------------------------------------------
;Execution comes here thru interrupt 9 every time a key is pressed or released.
;-----------------------------------------------------------------------------
keyboard        proc near
                sti                             ;set interrupt enable flag
                pushf                           ;push flags to simulate INT
                call keyboard_int               ;call keyboard handling routine
                push ax                         ;save AX
                mov ah,2                        ;get keyboard shift status
                int 16h
                and al,0Fh                      ;mask off upper 4 bits
                cmp al,9                        ;Alt/Rt-Shift pressed?
                pop ax                          ;restore AX
                jne kb_exit                     ;no, then exit
                cmp program_status,0            ;popup routine already active?
                jne kb_exit                     ;yes, then ignore keypress
                mov request_flag,18             ;set request flag
kb_exit:        iret
keyboard        endp
;
;-----------------------------------------------------------------------------
;Interrupt 8 handling routine.
;-----------------------------------------------------------------------------
timer           proc near
                pushf                           ;call BIOS routine
                call timer_int
                cmp request_flag,0              ;flag set?
                je timer_exit                   ;no, then exit
                cmp flag_10h,0                  ;video flag set?
                jne dectime                     ;yes, then exit
                cmp flag_13h,0                  ;disk flag set?
                jne dectime                     ;yes, then exit
                push es                         ;save ES and DI
                push di
                mov es,dos_segment              ;check INDOS flag
                mov di,indos_offset
                cmp byte ptr es:[di],0
                jne poptime                     ;exit if it's set
                mov di,errflag_offset           ;check critical error flag
                cmp byte ptr es:[di],0
                jne poptime                     ;exit if it's set
                pop di                          ;restore registers
                pop es
                mov request_flag,0              ;zero request flag
                call main                       ;call body of program
timer_exit:     iret
poptime:        pop di                          ;clean up the stack
                pop es
dectime:        dec request_flag                ;decrement request flag
                iret
timer           endp
;
;-----------------------------------------------------------------------------
;Interrupt 10h handling routine.
;-----------------------------------------------------------------------------
video           proc near
                pushf                           ;push flags onto stack
                inc flag_10h                    ;increment flag
                call video_int                  ;call BIOS routine
                dec flag_10h                    ;decrement flag
                iret
video           endp
;
;-----------------------------------------------------------------------------
;Interrupt 13h handling routine.
;-----------------------------------------------------------------------------
bdisk           proc far
                pushf                           ;push flags onto stack
                inc flag_13h                    ;set 'busy' flag
                call bdisk_int                  ;call BIOS routine
                pushf                           ;save output flags
                dec flag_13h                    ;clear flag
                popf                            ;restore output flags
                ret 2                           ;exit without destroying flags
bdisk           endp
;
;-----------------------------------------------------------------------------
;Interrupt 28h handling routine.
;-----------------------------------------------------------------------------
backproc        proc near
                pushf                           ;call original routine
                call bp_int
                cmp request_flag,0              ;request flag clear?
                je bp_exit                      ;yes, then exit
                cmp flag_10h,0                  ;video flag set?
                jne bp_exit                     ;yes, then exit
                cmp flag_13h,0                  ;disk flag set?
                jne bp_exit                     ;yes, then exit
                push es                         ;save ES and DI
                push di
                mov es,dos_segment              ;check critical error flag
                mov di,errflag_offset
                cmp byte ptr es:[di],0
                pop di                          ;clean up the stack
                pop es
                jne bp_exit
                mov request_flag,0              ;clear request flag
                call main                       ;call main routine
bp_exit:        iret                            ;done - exit
backproc        endp
;
;-----------------------------------------------------------------------------
;Interrupt 24h handling routine (DOS 3.X only).
;-----------------------------------------------------------------------------
ioerr           proc near
                mov al,3                        ;fail the call in progress
ioexit:         iret                            ;give control back to DOS
ioerr           endp
;
;-----------------------------------------------------------------------------
;MAIN is the routine called to pop up and manipulate the CardFile window.
;-----------------------------------------------------------------------------
```

(continues)

CARDFILE.ASM: *The assembly language source code for CARDFILE.COM.*

```
main            proc near
                mov program_status,1            ;set program active flag
                cli                             ;make sure interrupts are off
                mov ss_register,ss              ;save stack registers
                mov sp_register,sp
                push cs                         ;switch to internal stack
                pop ss
                mov sp,offset filespec
                sti                             ;enable interrupts
                push ax                         ;save other registers
                push bx
                push cx
                push dx
                push si
                push di
                push ds
                push es
                push bp
                mov ah,15                       ;get video mode and page
                int 10h
                cmp al,3                        ;mode 0, 1, 2, or 3?
                jbe main1                       ;yes, then continue
                cmp al,7                        ;mode 7?
                je main1                        ;yes, then continue
;
;Restore registers and stack before exit.
;
exit:           pop bp                          ;restore registers and exit
                pop es
                pop ds
                pop di
                pop si
                pop dx
                pop cx
                pop bx
                pop ax
                cli                             ;interrupts off
                mov ss,ss_register              ;switch to original stack
                mov sp,sp_register
                sti                             ;interrupts on
                mov program_status,0            ;clear status flag
                ret
;
;Set DS and ES segment registers.
;
main1:          push cs                         ;set DS to code segment
                pop ds
                assume ds:code
                mov ax,bios_data                ;point ES to BIOS data
                mov es,ax
                assume es:bios_data
                cmp crt_cols,80                 ;at least 80 columns displayed?
                jb exit                         ;no, then exit
;
;Save needed video parameters.
;
                mov video_page,bh               ;active video page
                mov ah,3                        ;get cursor mode and location
                int 10h
                mov cursor_mode,cx
                mov cursor_pos,dx
                mov dx,addr_6845                ;get CRTC base address
                push dx                         ;save it for later
                mov al,14                       ;specify register number
                out dx,al
                inc dx                          ;point DX to data port
                in al,dx                        ;read high byte of address
                mov ah,al                       ;save it
                dec dx                          ;back to index register
                mov al,15                       ;specify register number
                out dx,al
                inc dx                          ;back to data port
                in al,dx                        ;read low byte of address
                mov cursor_addr,ax              ;save cursor address
;
;Determine whether an EGA is present and active in the system.
;
                mov ah,12h                      ;see if EGA is present
                mov bl,10h
                int 10h
                cmp bl,10h                      ;did BL return unchanged?
                je main2                        ;yes, then there's no EGA here
                test ega_info,8                 ;is the EGA currently active?
                jne main2                       ;no, then branch
                mov adapter,2                   ;set ADAPTER for EGA
                push bx                         ;save BX
                mov ax,1130h                    ;get number of scan lines per char
                int 10h
                dec cl                          ;form cursor definition in CX
                mov ch,cl
                sub ch,2
                mov new_cursor,cx               ;save cursor definition
                mov si,offset color_attr        ;point SI to color parms
                pop bx                          ;retrieve BX
                or bh,bh                        ;EGA attached to color monitor?
                je main4                        ;yes, then branch
                mov si,offset mono_attr         ;no, then point SI to mono parms
                jmp short main4
;
;Determine whether the active video adapter is a CGA or an MDA.
;
main2:          test addr_6845,40h              ;is bit 6 of the CRTC address set?
                jz main3                        ;no, then it's monochrome
                mov adapter,1                   ;set ADAPTER for a CGA
                mov new_cursor,0607h            ;define cursor shape
                mov si,offset color_attr        ;point SI to color parms
                jmp short main4
main3:          mov adapter,0                   ;set ADAPTER for an MDA
                mov new_cursor,0B0Ch            ;define monochrome cursor
                mov si,offset mono_attr         ;point SI to mono parms
;
;Set video parameters for color or monochrome.
;
main4:          push cs                         ;set ES to the code segment
```

```
                pop es
                assume es:nothing
                mov di,offset video_segment     ;point DI to destination
                mov cx,3                        ;3 words to move
                cld                             ;clear DF
                rep movsw                       ;transfer the values
;
;Save the current active PSP address and activate this PSP.
;
                push es                         ;save ES
                mov xflag,0                     ;clear flag
                cmp dos_version,2               ;DOS version 2.X?
                jne main5
                mov es,dos_segment              ;point ES:DI to INDOS
                mov di,indos_offset
                cmp byte ptr es:[di],0          ;INDOS clear?
                je main5                        ;yes, then branch
                mov di,errflag_offset           ;point ES:DI to error flag
                cmp byte ptr es:[di],0          ;critical error flag clear?
                jne main5                       ;no, then branch
                mov byte ptr es:[di],1          ;set critical error flag manually
                mov xflag,1                     ;set change flag
main5:          mov ah,51h                      ;get current PSP segment
                int 21h
                mov oldpsp,bx                   ;save it
                mov ah,50h                      ;make this the active PSP
                push cs
                pop bx
                int 21h
                cmp xflag,0                     ;XFLAG clear?
                je main6                        ;yes, then branch
                mov di,errflag_offset           ;point ES:DI to error flag
                mov byte ptr es:[di],0          ;restore error flag value
main6:          pop es                          ;restore ES
;
;Reset the interrupt 1Bh, 23h, and 24h vectors and open the CardFile window.
;
                call ioset                      ;reset interrupt vectors
                cmp adapter,1                   ;disable CGA video
                jne main7
                call disable_cga
main7:          call save_screen                ;save memory to be overwritten
                call make_screen                ;open the CardFile window
                cmp adapter,1                   ;enable CGA video
                jne main8
                call enable_cga
main8:          mov ah,1                        ;hide the cursor
                mov ch,20h
                int 10h
                cmp numrec,0                    ;any records in memory?
                je main10                       ;no, then branch
                call show_record                ;display current record
;
;Wait for a keystroke and exit when ESC is pressed.
;
main10:         call getkey                     ;wait for a keypress
                or al,al                        ;extended code entered?
                je main12                       ;yes, then branch
                cmp al,13                       ;ENTER pressed?
                jne main11                      ;no, then branch around
                cmp numrec,2                    ;at least 2 records?
                jb main10                       ;no, then ignore keypress
                jmp short main20                ;yes, then do a PgDn
main11:         cmp al,27                       ;ESC pressed?
                jne main10                      ;no, then ignore keypress
                jmp short escape                ;yes, then close window and exit
;
;An extended code was entered.  Check for an Alt-character key combination.
;
main12:         cmp ah,16                       ;scan code < 16 (Alt-Q)?
                jb main10                       ;yes, then ignore it
                cmp ah,50                       ;scan code > 50 (Alt-M)?
                je main13                       ;yes, then branch and continue
                call qsearch                    ;do quick search
                jmp main10                      ;return for another keypress
;
;Check for a press of any function key F1 through F6.
;
main13:         cmp ah,59                       ;scan code < 59 (F1)?
                jb main10                       ;yes, then ignore it
                cmp ah,64                       ;scan code > 64 (F6)?
                je main14                       ;yes, then branch and continue
                sub ah,59                       ;normalize scan code
                mov bl,ah                       ;transfer result
                xor bh,bh                       ;byte to word in BX
                shl bx,1                                        ;double index in BX
                call word ptr cs:[offset jump_table+bx]         ;call routine
                jmp main10                                      ;return
;
;Check for Home, End, PgUp, and PgDn.
;
main14:         cmp numrec,2                    ;are there at least 2 records?
                jb main10                       ;no, then ignore keypress
                cmp ah,71                       ;Home key?
                jne main16                      ;no, then branch
                mov recptr,1                    ;set pointer to first record
main15:         call show_record                ;display record
                jmp main10                      ;return
main16:         cmp ah,79                       ;End key?
                jne main18                      ;no, then branch
main17:         mov al,numrec                   ;get number of records
                mov recptr,al                   ;set pointer to last record
                jmp main15                      ;display record
main18:         cmp ah,73                       ;PgUp key?
                jne main19                      ;no, then branch
                dec recptr                      ;adjust pointer
                cmp recptr,0                    ;wrap around if necessary
                jne main15
                jmp main17
main19:         cmp ah,81                       ;PgDn key?
                jne main10                      ;no, then ignore keypress
main20:         mov al,numrec                   ;presently showing last record?
```

(CARDFILE.ASM continues)

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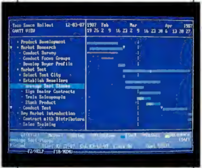

```
Taco Sauce Rollout      12-03-87 1987 Feb          Mar               Apr      1987
GANTT VIEW                       19 26 2  9  16 23 2  9  16 23 30 6  13 20 27
  • Product Development
▼ • Market Research
   - Conduct Survey
   - Conduct Focus Groups
   - Develop Buyer Profile
  • Market Test
   • Select Test City
   • Establish Resellers
    - Arrange Test Stores
    - Sign Dealer Contracts
    - Train Salespeople
    - Stock Product
▼  - Conduct Test
  • New Market Introduction
   - Contract with Distributors
   - Sales Training

 ——F2/HELP——F10/MENU——
```

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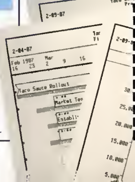

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CIRCLE 502 ON READER SERVICE CARD

```
                cmp al,recptr
                je main21                       ;yes, then branch
                inc recptr                      ;no, then advance pointer
                jmp main10                      ;display record
main21:         mov recptr,1                    ;set pointer to first record
                jmp main10                      ;display record
;
;Restore interrupt vectors and former active PSP.
;
escape:         mov ah,50h                      ;restore active PSP label
                mov bx,oldpsp
                int 21h
                call ioreset                    ;restore interrupt vectors
;
;Close the Cardfile window in preparation for exit.
;
                cmp adapter,1                   ;disable CGA video
                jne esc1
                call disable_cga
esc1:           call restore_screen             ;restore screen contents
                cmp adapter,1                   ;enable CGA video
                jne esc2
                call enable_cga
;
;Restore the cursor's former position in the BIOS data area and the CRTC.
;
esc2:           mov ah,2                        ;set cursor position thru BIOS
                mov bh,video_page
                mov dx,cursor_pos
                int 10h
                pop dx                          ;recover CRTC base address
                mov cx,cursor_addr              ;restore cursor address
                mov al,14                       ;CRTC register number
                out dx,al
                inc dx
                mov al,ch
                out dx,al                       ;write high byte of address
                dec dx
                mov al,15                       ;CRTC register number
                out dx,al
                inc dx
                mov al,cl
                out dx,al                       ;write low byte
;
;Display the cursor, bypassing EGA cursor emulation logic, and exit.
;
                cmp adapter,2                   ;EGA on board?
                jne esc3                        ;no, then branch
                call show_cursor                ;retain current shape
                jmp exit
esc3:           mov ah,1                        ;restore cursor shape
                mov cx,cursor_mode
                int 10h
                jmp exit                        ;exit
main            endp
;
;-----------------------------------------------------------------------------
;SAVE_SCREEN saves the contents of the screen that underlie the window.
;-----------------------------------------------------------------------------
linesum         dw ?
video_address dw ?
;
save_screen     proc near
                push ds                         ;save DS
                mov ax,bios_data                ;point it to BIOS data area
                mov ds,ax
                assume ds:bios_data
                mov ax,crt_cols                 ;get number of display columns
                mov linesum,ax                  ;calculate distance from end of
                sub linesum,44                  ;  one line to start of next
                shl linesum,1
                mov bl,8                        ;calculate starting address
                mul bl                          ;result in AX
                shl ax,1                        ;double result for attr bytes
                add ax,36                       ;add line offset
                mov si,ax                       ;transfer to SI
                add si,crt_start                ;add page offset
                mov video_address,si            ;save offset address
                mov ds,video_segment            ;then set DS to the video segment
                mov di,offset screen_buffer     ;point DI to storage buffer
                mov cx,10                       ;10 lines to save
save1:          push cx                         ;save line count
                mov cx,44                       ;44 characters per line
                rep movsw                       ;transfer one line to storage
                pop cx                          ;retrieve line count
                add si,linesum                  ;point SI to next video line
                loop save1                      ;loop until all lines are saved
                pop ds                          ;restore DS
                assume ds:code
                ret                             ;exit
save_screen     endp
;
;-----------------------------------------------------------------------------
;RESTORE_SCREEN writes the stored screen image to video memory.
;-----------------------------------------------------------------------------
restore_screen proc near
                push es                         ;save ES register value
                mov di,video_address            ;point DI to starting video offset
                mov es,video_segment            ;point ES to video memory
                mov si,offset screen_buffer     ;point DS:SI to screen image
                mov cx,10                       ;10 lines to restore
restore1:       push cx                         ;save line count
                mov cx,44                       ;44 characters per line
                rep movsw                       ;restore one line
                pop cx                          ;retrieve line count
                add di,linesum                  ;set DI to next video line
                loop restore1                   ;loop until done
                pop es                          ;restore ES
                ret
restore_screen endp
;
;-----------------------------------------------------------------------------
;MAKE_SCREEN writes an image of the CardFile window to video memory.
;-----------------------------------------------------------------------------
make_screen     proc near
                push es                         ;save ES
                mov es,video_segment            ;point ES:DI to video memory
                mov di,video_address
                mov al,218                      ;line no. 1
                mov ah,border_attr
                stosw
                mov al,196
                mov cx,42
                rep stosw
                mov al,191
                stosw
                add di,linesum
                mov si,offset titles            ;lines 2 thru 7
                mov cx,6                        ;6 lines
make1:          push cx
                call formline
                add di,linesum
                pop cx
                loop make1
                mov al,179                      ;line no. 8
                stosw
                push ax
                mov al,32
                mov ah,text_attr
                stosw
                push ax
                mov al,196
                mov cx,40
                rep stosw
                pop ax
                stosw
                pop ax
                stosw
                add di,linesum
                stosw                           ;line no. 9
                push ax
                mov al,32
                mov ah,menu_attr
                stosw
                push ax
                mov si,offset menuline1
                mov cx,40
make2:          lodsb
                stosw
                loop make2
                pop ax
                stosw
                pop ax
                stosw
                add di,linesum
                mov al,192                      ;line no. 10
                stosw
                mov al,196
                mov cx,42
                rep stosw
                mov al,217
                stosw
                pop es                          ;restore ES
                ret
make_screen     endp
;
;-----------------------------------------------------------------------------
;FORMLINE is called by MAKE_SCREEN to help with the dirty work.
;-----------------------------------------------------------------------------
formline        proc near
                mov al,179                      ;write border character
                mov ah,border_attr
                stosw
                push ax                         ;save it for later
                mov cx,6                        ;do next 6 characters
                mov ah,text_attr
forml:          lodsb
                stosw
                loop forml
                mov al,32                       ;add 2 blanks
                stosw
                stosw
                mov ah,record_attr              ;then add 34 blank characters
                mov cx,34
                rep stosw
                pop ax                          ;finish with border character
                stosw
                ret
formline        endp
;
;-----------------------------------------------------------------------------
;QSEARCH pages to the record whose first character matches the Alt key pressed.
;-----------------------------------------------------------------------------
qsearch         proc near
                cmp numrec,2                    ;at least 2 records to search?
                jb qs3                          ;no, then exit
                mov al,ah                       ;transfer scan code to AL
                sub al,16                       ;normalize it
                mov bx,offset key_table         ;address table of equivalents
                xlat                            ;get corresponding ASCII code
                mov dl,al                       ;transfer it to DL
                mov cl,numrec                   ;get record count in CX
                xor ch,ch
                mov al,1                        ;initialize record index
qs1:            push ax                         ;save index
                push cx                         ;save count
                call record_address             ;get address of current record
                cmp [di],dl                     ;compare characters
                pop cx                          ;retrieve count and index
                pop ax
                jae qs2                         ;end search
                inc al                          ;increment index
                loop qs1                        ;loop back for next record
                dec al                          ;search exhausted
qs2:            cmp al,recptr                   ;record already showing?
                je qs3                          ;yes, then exit
```

(CARDFILE.ASM continues)

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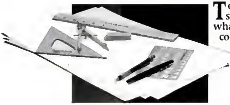

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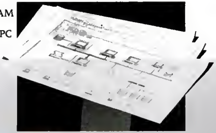

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CIRCLE 164 ON READER SERVICE CARD

■ UTILITIES

```
                mov recptr,al                   ;no, then change display
                call show_record
qs3:            ret
qsearch         endp
;
;-----------------------------------------------------------------------
;SEARCH searches data for occurrence of a string input by the user.
;-----------------------------------------------------------------------
strlen          db ?                            ;string length
passes          db ?                            ;number of search loops
;
search          proc near
                cmp numrec,0                    ;any records to search?
                je search_exit                  ;no, then exit
                mov si,offset menuline4         ;prepare menu line for input
                call write_menu
                xor di,di                       ;read string from keyboard
                mov dx,0E1Ah
                mov cl,32
                call readln
                or cl,cl                        ;anything entered?
                jne search1                     ;yes, then continue
search_exit:    mov si,offset menuline1         ;restore menu line and exit
                call write_menu
                ret
;
;Set search parameters and begin the scan.
;
search1:        mov strlen,cl                   ;save string length
                mov ch,33                       ;determine no. of passes per line
                sub ch,cl
                mov passes,ch                   ;save it
                mov al,recptr                   ;start search at current record
                mov cl,numrec                   ;set max search length
                xor ch,ch
search2:        push ax                         ;save record number
                push cx                         ;save record count
                call record_address             ;get address of current record
                mov cx,6                        ;6 lines per record
search3:        push cx                         ;save line count
                push di                         ;save line address
                mov cl,passes                   ;set number of passes per line
                xor ch,ch
search4:        push cx                         ;save pass count
                push di                         ;save search address within line
                mov cl,strlen                   ;number of bytes to compare
                xor ch,ch
                xor si,si                       ;point SI to input buffer
search5:        lodsb                           ;get a byte from the input buffer
                and al,0DFh                     ;capitalize it
                mov bl,es:[di]                  ;get a byte from the record
                and bl,0DFh                     ;capitalize it
                inc di                          ;advance pointer
                cmp al,bl                       ;are the two bytes identical?
                jne nextpos                     ;no, then try next position
                loop search5                    ;yes, then try next byte
;
;A match was found.  Clean up the stack and display the record.
;
                add sp,10                       ;delete last 5 words PUSHed
                pop ax                          ;retrieve current record number
                push ax                         ;push it back onto the stack
                mov cl,numrec                   ;restart the record counter
                xor ch,ch
                inc cx
                push cx                         ;shove it onto the stack
                mov recptr,al                   ;set current record to this one
                call show_record                ;display new record
                mov si,offset menuline5         ;display new menu line
                call write_menu
searchkey:      call getkey                     ;wait for a keypress
                cmp al,13                       ;ENTER key?
                je nextrec                      ;yes, then continue search
                cmp al,27                       ;ESC key?
                jne searchkey                   ;no, then ignore the keypress
                pop cx                          ;clean up the stack
                pop ax
                jmp search_exit                 ;exit
;
;Advance to the next position and continue the string search.
;

nextpos:        pop di                          ;retrieve address
                pop cx                          ;retrieve pass count
                inc di                          ;advance to next position on line
                loop search4                    ;loop back for another try
nextline:       pop di                          ;retrieve line address
                pop cx                          ;retrieve line count
                add di,32                       ;advance pointer to next line
                loop search3                    ;loop back
nextrec:        pop cx                          ;retrieve record count
                pop ax                          ;retrieve current record number
                cmp al,numrec                   ;currently on last record?
                je reset                        ;yes, then wrap around
                inc al                          ;no, then advance record pointer
                jmp short next1
reset:          mov al,1                        ;reset record pointer
next1:          loop search2                    ;reenter main loop
;
;All records were searched and no match was found.
;
                mov si,offset menuline6         ;print message
                call write_menu
search6:        call getkey                     ;wait for a press of ESC
                cmp al,27
                jne search6
                jmp search_exit                 ;exit
search          endp
;
;-----------------------------------------------------------------------
;DIAL dials the phone number currently displayed.
;-----------------------------------------------------------------------
linectrl        db ?                            ;Line Control Register value
divlsb          db ?                            ;baud rate divisor LSB
divmsb          db ?                            ;baud rate divisor MSB
intreg          db ?                            ;Interrupt Enable Register value
;
dial            proc near
                cmp numrec,0                    ;any records in memory?
                jne dstart                      ;yes, then branch
dial_exit:      ret                             ;no, then exit
;
;Save the current state of the COM port.
;
dstart:         mov si,comport                  ;get UART base address
                shl si,1
                push es                         ;save ES
                mov ax,bios_data                ;then point it to BIOS data area
                mov es,ax
                assume es:bios_data
                mov dx,rs232_base[si]
                pop es                          ;restore ES
                assume es:nothing
                or dx,dx                        ;is this port installed?
                je dial_exit                    ;no, then exit
                add dx,3                        ;point DX to Line Control Register
                push dx                         ;save the address
                in al,dx                        ;read LCR
                mov linectrl,al                 ;store value for later
                or al,80h                       ;set DLAB
                out dx,al
                sub dx,3                        ;point DX to Divisor LSB Register
                in al,dx                        ;read it
                mov divlsb,al                   ;save it
                inc dx                          ;point DX to Divisor MSB Register
                in al,dx                        ;read it
                mov divmsb,al                   ;save it
                mov al,linectrl                 ;recover Line Control setting
                and al,07Fh                     ;clear the high bit
                add dx,2                        ;point DX back to Line Control
                out dx,al                       ;clear DLAB
                sub dx,2                        ;address Interrupt Enable Register
                in al,dx                        ;read it
                mov intreg,al                   ;and save it
;
;Initialize the COM port.
;
                mov ah,0                        ;initialize COM port
                mov al,initstr                  ;baud rate and data format
                mov dx,comport                  ;COM port identifier
                int 14h
;
;Dial the phone number.
;
                mov si,offset dialstr           ;point DS:SI to 'ATDT' string
                call sendcom                    ;output string to COM port
                test ah,80h                     ;was the string sent?
                jnz time_out                    ;no, then modem isn't ready
                mov al,recptr                   ;get address of current record
                call record_address
                mov si,di
                add si,128                      ;point SI to 'Phone' line
                mov cx,32                       ;32 characters to check
dial1:          lodsb                           ;get one character
                cmp al,","                      ;is it a comma?
                je dial2                        ;yes, then send it
                cmp al,"0"                      ;less than ASCII zero?
                jb dial3                        ;yes, then ignore it
                cmp al,"9"                      ;greater than ASCII 9?
                ja dial3                        ;yes, then ignore it
dial2:          mov ah,1                        ;output byte to COM port
                int 14h
                test ah,80h                     ;was the byte successfully output?
                jnz time_out                    ;no, then modem isn't ready
dial3:          loop dial1                      ;loop until line is finished
                mov ax,013Bh                    ;terminate with semicolon and CR
                int 14h
                mov ax,010Dh
                int 14h
                test ah,80h                     ;were the bytes transmitted?
                jz dial5                        ;yes, then continue
;
;Display 'Modem not ready' message and wait for ESC to be pressed.
;
time_out:       mov si,offset menuline12        ;print message
                call write_menu
dial4:          call getkey                     ;wait for a press of ESC
                cmp al,27
                jne dial4
                jmp dial8
;
;Wait for a press of the spacebar, then force the modem to hang up.
;
dial5:          mov si,offset menuline10        ;display 'Pick up phone...
                call write_menu
dial6:          call getkey                     ;wait for a press of the spacebar
                cmp al,32
                jne dial6
                mov si,offset hangupstr         ;point SI to 'ATH0' string
                mov dx,comport                  ;specify COM port
                call sendcom                    ;output it to the COM port
                mov cx,6000h                    ;I/O delay
dial7:          loop dial7
;
;Restore the COM port to its original state and exit.
;
dial8:          pop dx                          ;retrieve UART address
                mov al,80h                      ;set DLAB
                out dx,al
                sub dx,3                        ;point DX to Divisor LSB
                mov al,divlsb                   ;reset it
                out dx,al
                inc dx                          ;point DX to MSB
                mov al,divmsb                   ;reset it
                out dx,al
                add dx,2                        ;point DX to Line Control
```

(CARDFILE.ASM continues)

```
                xor al,al                       ;clear DLAB
                out dx,al
                sub dx,2                        ;point DX to Interrupt Enable
                mov al,intreg                   ;restore it
                out dx,al
                add dx,2                        ;restore Line Control Register
                mov al,linectrl
                out dx,al
                mov si,offset menuline1         ;restore menu line and exit
                call write_menu
                ret
dial            endp
;
;-----------------------------------------------------------------------------
;SENDCOM outputs an ASCIIZ string to the designated COM port.
;Entry:  DS:SI - string address          Exit:  AH bit 7 clear - string sent
;        DX    - 0 = COM1, 1 = COM2             AH bit 7 set   - time out
;-----------------------------------------------------------------------------
sendcom         proc near
                lodsb                           ;get a byte
                or al,al                        ;zero terminator?
                je comexit                      ;yes, then exit
                mov ah,1                        ;output byte
                int 14h
                test ah,80h                     ;was byte transmitted?
                jz sendcom                      ;yes, loop back for more
comexit:        ret        ;exit
sendcom         endp
;
;-----------------------------------------------------------------------------
;EDIT allows the current record to be edited.
;-----------------------------------------------------------------------------
edit            proc near
                cmp numrec,0                    ;any records to edit?
                je edit1                        ;no, then exit
                mov al,recptr                   ;get current record number
                call record_address             ;get its address and position
                mov slotno,al                   ;save position
                push di                         ;save address
                call delete_record              ;delete it
                pop di                          ;recover address
                push di                         ;save it again
                mov si,offset menuline9         ;address menu line text
                call edit_record                ;allow it to be edited
                pop si                          ;place address in SI
                jc no_entry                     ;branch if entry now blank
                call find_position              ;determine logical position
                mov bl,slotno                   ;retrieve physical position
                call insert_record              ;insert record into the stack
                mov recptr,cl                   ;modify current record number
edit1:          ret                             ;exit
no_entry:       cmp numrec,0                    ;any records left after deletion?
                je edit1                        ;no, then we're done
                mov al,numrec                   ;get number of records
                cmp al,recptr                   ;RECPTR in range?
                jae edit2                       ;yes, then branch
                dec recptr                      ;no, then modify it
edit2:          call show_record                ;display new current record
                ret
edit            endp
;
;-----------------------------------------------------------------------------
;CREATE allows a new record to be created and inserted.
;-----------------------------------------------------------------------------
create          proc near
                mov al,numrec                   ;retrieve number of records
                cmp al,maxrec                   ;room for another record?
                jne create1                     ;yes, then branch
                mov si,offset menuline7         ;no, then print error message
                call write_menu
create0:        call getkey                     ;wait for a press of ESC
                cmp al,27
                jne create0
                mov si,offset menuline1         ;restore menu line
                call write_menu
                ret                             ;exit
create1:        call clear_window               ;clear the current display
                xor al,al                       ;zero AL
                call record_address             ;get address of empty record slot
                mov slotno,al                   ;save position
                mov al,32                       ;blank the record
                mov cx,192
                rep stosb
                sub di,192                      ;point DI back to start of record
                push di                         ;save address
                mov si,offset menuline3         ;set text address
                call edit_record                ;allow record to be edited
                pop si                          ;get address in SI
                jc blank_entry                  ;branch if new entry is blank
                call find_position              ;determine new record position
                mov bl,slotno                   ;retrieve its physical position
                call insert_record              ;insert new record into stack
                mov recptr,cl                   ;point RECPTR to new record
                ret
blank_entry:    cmp numrec,0                    ;any records?
                je blank1                       ;no, then exit
                call show_record                ;display current record
blank1:         ret
create          endp
;
;-----------------------------------------------------------------------------
;DELETE deletes the current record.
;-----------------------------------------------------------------------------
delete          proc near
                cmp numrec,0                    ;any records to delete?
                je del_exit                     ;no, then exit
                mov si,offset menuline2         ;request verification
                call write_menu
del1:           call getkey                     ;get keyboard response
                cmp al,13                       ;ENTER pressed?
                je del2                         ;yes, then continue
                cmp al,27                       ;ESC pressed?
                jne del1                        ;no, then get another keypress
del2:           push ax                         ;save response
```

```
                mov si,offset menuline1         ;restore menu line
                call write_menu
                pop ax                          ;retrieve response
                cmp al,13                       ;delete the record?
                jne del_exit                    ;no
                call delete_record              ;delete current record
                cmp numrec,0                    ;any records left?
                jne del3                        ;yes, then branch
                call clear_window               ;no, then clear display
del_exit:       ret                             ;exit
del3:           mov al,numrec                   ;get record count
                cmp al,recptr                   ;is RECPTR in range?
                jae del4                        ;yes, then branch
                dec recptr                      ;no, then make sure it is
del4:           call show_record                ;display new current record
                ret
delete          endp
;
;-----------------------------------------------------------------------------
;SAVE writes the data in memory to disk.
;-----------------------------------------------------------------------------
save            proc near
                cmp numrec,0                    ;any records to save?
                jne fsave1                      ;yes, then continue
                ret                             ;no, then exit
fsave1:         cmp fileflag,0                  ;does a filespec exist?
                jne fsave2                      ;yes, then branch
;
;Read a filespec input from the keyboard.
;
getname:        mov si,offset menuline13        ;print input prompt
                call write_menu
                xor di,di                       ;prepare for call to READLN
                mov dx,0E1Ah
                mov cl,34
                call readln                     ;read the filespec
                or cl,cl                        ;anything entered?
                je save_exit                    ;no, then exit
                mov fileflag,1                  ;set filespec indicator
                xor si,si                       ;copy filespec into buffer
                mov di,offset filespec
                xor ch,ch
                rep movsb
                mov byte ptr es:[di],0          ;zero last byte
;
;Open the file and write record data out to it.
;
fsave2:         mov dx,offset filespec          ;point DX to filespec
                mov ah,3Ch                      ;open/create file
                xor cx,cx                       ;normal attributes
                int 21h
                jc getname                      ;get new filespec if open failed
fsave3:         mov bx,ax                       ;transfer file handle to BX
                mov ah,40h                      ;write NUMREC byte to file
                mov cx,1
                mov dx,offset numrec
                int 21h
                jc save_error                   ;branch on error
                cmp ax,1                        ;byte successfully written?
                jb diskfull                     ;no, then disk is full
                mov al,1                        ;initialize record number
                mov cl,numrec                   ;get number of records to write
                xor ch,ch
fsave4:         push cx                         ;save count
                push ax                         ;save record number
                call record_address             ;get address of current record
                mov dx,di                       ;transfer it to DX
                mov cx,192                      ;192 bytes per record
                mov ah,40h                      ;write one record
                int 21h
                mov dx,ax                       ;transfer byte count to DX
                pop ax                          ;retrieve record number and count
                pop cx
                jc save_error                   ;branch on error
                cmp dx,192                      ;entire record written?
                jb diskfull                     ;no, then disk is full
                inc al                          ;next record
                loop fsave4                     ;loop until done
closefile:      mov ah,3Eh                      ;close file
                int 21h
save_exit:      mov si,offset menuline1         ;restore menu line
                call write_menu
                ret                             ;exit
;
;An error was encountered during the save.
;
save_error:     mov si,offset menuline11        ;print error message
                push bx                         ;save file handle
                call write_menu
                pop bx                          ;retrieve file handle
error2:         call getkey                     ;wait for a press of ESC
                cmp al,27
                jne error2
                jmp short closefile             ;close file and resume
;
;No room left on the disk.
;
diskfull:       mov si,offset menuline8         ;print 'Disk full' message
                push bx                         ;save file handle
                call write_menu
                pop bx                          ;retrieve file handle
full2:          call getkey                     ;wait for a press of ESC
                cmp al,27
                jne full2
                jmp short closefile             ;and exit
save            endp
;
;-----------------------------------------------------------------------------
;DISABLE_CGA and ENABLE_CGA disable and enable CGA video output.
;-----------------------------------------------------------------------------
disable_cga     proc near
```

(CARDFILE.ASM continues)

```
                mov dx,3DAh                     ;address of Status Register
disable1:       in al,dx                        ;get status
                test al,8                       ;vertical retrace active?
                je disable1                     ;no, then wait
                sub dx,2                        ;MSR address in DX
                mov al,25h                      ;value to disable video
                out dx,al                       ;disable video output
                ret
disable_cga     endp
;
enable_cga      proc near
                mov ah,15                       ;get video mode
                int 10h
                mov bx,offset enable_values     ;get value to enable display
                xlat                            ;value in AL
                mov dx,3D8h                     ;MSR address
                out dx,al                       ;enable video output
                ret
enable_cga      endp
;
;------------------------------------------------------------------------------
;GETKEY waits for a keypress and returns the keycode in AX.
;Exit:  AX - keycode
;------------------------------------------------------------------------------
getkey          proc near
                mov ah,1                        ;check keyboard buffer
                int 16h
                jnz getkey1                     ;jump if buffer contains a keycode
                int 28h                         ;no key pressed - issue int 28h
                jmp getkey                      ;loop back to try again
getkey1:        mov ah,0                        ;get keycode from buffer
                int 16h
                ret                             ;exit with keycode in AX
getkey          endp
;
;------------------------------------------------------------------------------
;INSERT_RECORD inserts a record into the table.
;Entry:  BL - slot number
;        CL - index number
;------------------------------------------------------------------------------
insert_record proc near
                push cx                         ;save index number
                mov di,offset index_table       ;point DI to index table
                mov al,cl                       ;get index number in AL for search
                mov cl,maxrec                   ;set counter
                xor ch,ch
insert1:        cmp [di],al                     ;index less than new index?
                jb insert2                      ;yes, then branch
                inc byte ptr [di]               ;increment index
insert2:        inc di                          ;advance DI to next index
                loop insert1                    ;loop until all indexes examined
                pop cx                          ;retrieve new index number
                xor bh,bh                       ;byte to word in BX
                mov di,offset index_table       ;point DI to index table
                mov [di+bx],cl                  ;deposit new index into table
                inc numrec                      ;increment record count by 1
                ret
insert_record endp
;
;------------------------------------------------------------------------------
;DELETE_RECORD deletes the record indexed by RECPTR.
;------------------------------------------------------------------------------
delete_record proc near
                mov al,recptr                   ;search for current record slot
                mov di,offset index_table
                mov cl,maxrec
                xor ch,ch
                repne scasb
                dec di                          ;back to matching byte
                mov byte ptr [di],0             ;zero current index
                mov al,recptr                   ;get current record number
                mov di,offset index_table               ;point DI to index table
                mov cl,maxrec                   ;set counter
                xor ch,ch
delrec1:        cmp [di],al                     ;index less than current index?
                jb delrec2                      ;yes, then branch
                dec byte ptr [di]               ;no, decrement index
delrec2:        inc di                          ;advance to next index
                loop delrec1                    ;loop until all records examined
                dec numrec                      ;decrement record count by 1
                ret
delete_record endp
;
;------------------------------------------------------------------------------
;EDIT_RECORD allows the record addressed by ES:DI to be edited.
;Entry:  ES:DI - record address            Exit:  CF clear - record valid
;        DS:SI - menu line text string            CF set   - record blank
;------------------------------------------------------------------------------
edit_record     proc near
                push di                         ;save starting address
                call write_menu                 ;write new menu line
                mov bh,video_page               ;set BH for video calls
                mov ah,2                        ;set initial cursor position
                mov dx,071Bh
                int 10h
                call show_cursor                ;display the cursor
;
;Wait for a keypress.
;
editrec1:       call getkey                     ;get a keypress
                or al,al                        ;extended code?
                jne editrec2                    ;no, then branch
                jmp short extend                ;go to extended code handler
editrec2:       cmp al,8                        ;backspace key?
                je bspace
                cmp al,13                       ;ENTER key?
                je enter
                cmp al,32                       ;ASCII code less than 32?
                jb editrec1                     ;yes, then ignore it
;
;Process a press of a character key.
;
                cmp di,59                       ;at the end of the line?
                je editrec1                     ;yes, then ignore keypress
                stosb                           ;deposit character in record
                mov ah,10                       ;then print it
                mov cx,1
                int 10h
                mov ah,2                        ;advance the cursor
                inc dl
                int 10h
                jmp editrec1                    ;return for more
;
;Process a press of the BACKSPACE key.
;
bspace:         cmp dl,27                       ;any characters to delete?
                je editrec1                     ;no, then ignore keypress
                mov ah,2                        ;move cursor back one space
                dec dl
                int 10h
                mov ax,0A20h                    ;print a space character
                mov cx,1
                int 10h
                dec di                          ;decrement buffer pointer by 1
                mov byte ptr es:[di],32         ;insert an ASCII space
                jmp editrec1
;
;Process a press of the ENTER key.
;
enter:          mov al,dl                       ;reset DI to beginning of line
                xor ah,ah
                sub ax,27
                sub di,ax
                inc dh                          ;advance row number
                add di,32                       ;advance pointer
                cmp dh,13                       ;wrap around if necessary
                jne enter1
                mov dh,7
                sub di,192
enter1:         mov dl,27                       ;home the cursor
                mov ah,2
                int 10h
                jmp editrec1                    ;return to input loop
;
;Process a press of either Cursor-Left or Cursor-Right.
;
extend:         cmp ah,75                       ;cursor left key?
                jne ext2                        ;no, then branch
                cmp dl,27                       ;already at left end of field?
                je ext1                         ;yes, then ignore keypress
                mov ah,2                        ;move cursor back one space
                dec dl
                int 10h
                dec di                          ;decrement buffer pointer
ext1:           jmp editrec1                    ;return
ext2:           cmp ah,77                       ;cursor right key?
                jne ext3                        ;no, then branch
                cmp dl,59                       ;cursor in last column?
                je ext1                         ;yes, then ignore keypress
                mov ah,2                        ;advance cursor
                inc dl
                int 10h
                inc di                          ;increment buffer pointer
                jmp editrec1                    ;return
;
;Process a press of either Cursor-Up or Cursor-Down.
;
ext3:           cmp ah,72                       ;cursor up key?
                jne ext5                        ;no, then branch
                dec dh                          ;decrement row number
                sub di,32                       ;set pointer to previous line
                cmp dh,6                        ;wrap around if necessary
                jne ext4
                mov dh,12
                add di,192
ext4:           mov ah,2                        ;move the cursor
                int 10h
                jmp editrec1                    ;return for another keypress
ext5:           cmp ah,80                       ;cursor down key?
                jne ext6                        ;no, then branch
                inc dh                          ;increment row number
                add di,32                       ;set pointer to next line
                cmp dh,13                       ;wrap around if necessary
                jne ext4
                mov dh,7
                sub di,192
                jmp ext4                        ;move cursor and return
;
;End the edit routine when F1 is pressed.
;
ext6:           cmp ah,59                       ;F1 key?
                jne ext4                        ;no, then ignore keypress
                mov ah,1                        ;hide the cursor
                mov ch,20h
                int 10h
                mov si,offset menutext          ;restore menu line
                call write_menu
                pop di                          ;recover starting address
                mov al,32                       ;ASCII space character
                mov cx,192                      ;192 bytes per record
                repe scasb                      ;check for non-space character
                jne ok                          ;OK if non-space found
                stc                             ;set CF to indicate blank entry
                ret
ok:             clc                             ;clear CF to indicate valid record
                ret
edit_record     endp
;
;------------------------------------------------------------------------------
;FIND_POSITION returns the new index of the record addressed by SI.
;Entry:  SI - record address               Exit:  CL - record number
;------------------------------------------------------------------------------
find_position proc near
                mov cl,1                        ;set index for first record
                cmp numrec,0                    ;any records in existence?
```

(CARDFILE.ASM continues)

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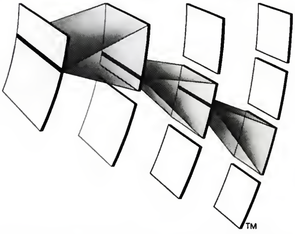

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```
                je find_exit                    ;no, then exit
find1:          mov al,cl                       ;get index in AL
                push cx                         ;save it
                call record_address             ;get address of next record
                push si                         ;save new record address
                mov cx,32                       ;32 bytes per record
find2:          cmpsb                           ;compare records
                ja next_record                  ;check next record
                jb slot_found                   ;alphabetical slot found
                loop find2                      ;goto next byte if these are equal
                jmp short slot_found            ;slot found if all equal
next_record:    pop si                          ;clean up the stack
                pop cx
                inc cl                          ;next record number
                cmp cl,numrec                   ;all records searched?
                jbe find1                       ;no, then loop back for more
find_exit:      ret                             ;yes, then we're done
slot_found:     pop si                          ;clean up the stack
                pop cx
                ret
find_position   endp
;
;------------------------------------------------------------------------
;SHOW_RECORD displays the record pointed to by RECPTR.
;------------------------------------------------------------------------
show_record     proc near
                mov al,recptr                   ;get current record number
                call record_address             ;get record address in DI
                mov si,di                       ;transfer it to SI
                mov bl,record_attr              ;get attribute to be used
                mov dx,0718h                    ;get initial cursor position
                mov cx,6                        ;6 lines to display
show1:          push cx                         ;save line counter
                push dx                         ;save cursor position
                mov cx,32                       ;32 characters per line
                call writeln                    ;0isplay one line
                pop dx                          ;retrieve cursor a0dress
                inc dh                          ;increment row number
                pop cx                          ;retrieve line counter
                loop show1                      ;loop until done
                ret
show_record     endp
;
;------------------------------------------------------------------------
;RECORD_ADDRESS returns the offset a0dress an0 slot number of a record.
;Entry: AL - record number                 Exit:  DI - record address
;                                                 AL - slot number
;------------------------------------------------------------------------
record_a0dress proc near
                mov di,offset index_table       ;point DI to index table
                mov cl,maxrec                   ;set counter
                xor ch,ch
                repne scasb                     ;search for current record number
                inc cx                          ;increment counter
                mov al,maxrec                   ;calculate offset address in AX
                sub al,cl
                push ax                         ;save slot number
                mul record_length
                a0d ax,offset main_buffer
                mov di,ax                       ;transfer address to DI
                pop ax                          ;recover slot number
                ret
record_address endp
;
;------------------------------------------------------------------------
;WRITE_MENU displays a line of text on the window's menu line.
;Entry:  DS:SI - address of text
;------------------------------------------------------------------------
write_menu      proc near
                mov ah,2                        ;position the cursor
                mov dx,0A14h
                mov bh,video_page
                int 10h
                mov ax,0920h                    ;erase current menu line
                mov bl,menu_attr
                mov cx,40
                int 10h
wm1:            lodsb                           ;get a character
                or al,al                        ;exit if it's the delimiter
                je wm2
                mov ah,0Eh                      ;write the character
                int 10h
                jmp short wm1                   ;loop until done
wm2:            ret
write_menu      endp
;
;------------------------------------------------------------------------
;WRITELN displays a string.
;Entry:  DS:SI - string address
;        BL    - attribute
;        CX    - string length
;        DH,DL - starting row and column
;------------------------------------------------------------------------
writeln         proc near
                mov bh,video_page               ;get page number for output
writel:         mov ah,2                        ;position cursor
                int 10h
                lodsb                           ;get one byte
                push cx                         ;save count
                mov cx,1                        ;zero repetitions
                mov ah,9                        ;int 10h function - write c/a
                int 10h                         ;write character/attribute
                inc dl                          ;advance cursor
                pop cx                          ;retrieve character count
                loop writel                     ;loop until done
                ret
writeln         endp
;
;------------------------------------------------------------------------
;READLN accepts input of a string entered from the keyboard.
;Entry:  ES:DI - buffer address            Exit: CL - string length
;        DH,DL - cursor start position
;        CL    - max length accepted
;------------------------------------------------------------------------
maxlen          db ?                            ;maximum string length
;
readln          proc near
                mov maxlen,cl                   ;save max length
                mov ah,2                        ;set cursor to start position
                mov bh,video_page
                int 10h
                call show_cursor                ;display the cursor
                xor cl,cl                       ;initialize counter
;
;Wait for a keypress.
;
read1:          call getkey                     ;get a character
                cmp al,13                       ;ENTER key?
                je read_exit                    ;yes, then exit
                cmp al,27                       ;ESC key?
                jne read2                       ;no, then branch
                xor cl,cl                       ;zero length
                jmp short read_exit             ;exit
read2:          cmp al,8                        ;backspace key?
                je backspace                    ;yes, then do backspace function
                cmp al,32                       ;ASCII 32 or greater?
                jb read1                        ;no, then ignore it
                cmp al,120                      ;ASCII 120 or less?
                ja rea01                        ;no, then ignore keypress
                cmp cl,maxlen                   ;room for another entry?
                je read1                        ;no, then ignore it
;
;Process the press of a character key.
;
                stosb                           ;deposit character in buffer
                push cx                         ;save character count
                mov ah,10                       ;print the character
                mov cx,1
                int 10h
                inc 0l                          ;advance the cursor
                mov ah,2
                int 10h
                pop cx                          ;retrieve count
                inc cl                          ;update count
                jmp read1                       ;go back for more
;
;Process a press of the BACKSPACE key.
;
backspace:      or cl,cl                        ;any characters to delete?
                je read1                        ;no, then ignore keystroke
                push cx                         ;save count
                dec dl                          ;move cursor back one space
                mov ah,2
                int 10h
                mov ah,10                       ;print a space character
                mov al,32
                mov cx,1
                int 10h
                pop cx                          ;retrieve count
                dec cl                          ;decrement it
                0ec di                          ;0ecrement buffer pointer
                jmp read1                       ;go back for more
;
;Hide the cursor and return.
;
read_exit:      mov ah,1                        ;hide the cursor
                mov ch,20h
                int 10h
                ret
readln          endp
;
;------------------------------------------------------------------------
;SHOW_CURSOR displays the cursor and discounts EGA cursor emulation logic.
;Entry:  NEW_CURSOR - starting and ending scan lines
;------------------------------------------------------------------------
show_cursor     proc near
                cmp adapter,2                   ;is an EGA currently active?
                jne cursor1                     ;no, then branch
                push es                         ;save ES
                mov ax,bios_data                ;point ES to BIOS data area
                mov es,ax
                assume es:bios_data
                push infobyte                   ;save EGA info byte
                or ega_info,1                   ;disable EGA cursor emulation
cursor1:        mov ah,1                        ;display the cursor
                mov cx,new_cursor
                int 10h
                cmp adapter,2                   ;is an EGA active?
                jne cursor_exit                 ;no, then exit
                pop infobyte                    ;restore EGA info byte
                pop es                          ;restore ES
                assume es:nothing
cursor_exit:    ret
show_cursor     endp
;
;------------------------------------------------------------------------
;CLEAR_WINDOW clears the record currently displayed in the window.
;------------------------------------------------------------------------
clear_window    proc near
                mov ax,0600h                    ;interrupt 10h, function 6
                mov cx,0718h
                mov 0x,0C38h
                mov bh,record_attr
                int 10h
                ret
clear_window    endp
;
;------------------------------------------------------------------------
;IOSET vectors interrupts 10h, 23h and 24h to internal handlers.  IORESET
;restores the original vector values.
;------------------------------------------------------------------------
ioset           proc near
                push es                         ;save ES
                mov ax,3510h                    ;get interrupt 10h vector
                int 21h
                mov old10h_segment,es           ;save it
```

(CARDFILE.ASM continues)

```
                mov old1Bh_offset,bx
                mov ah,25h                      ;point it to an IRET instruction
                mov dx,offset ioexit
                int 21h
                mov ax,3523h                    ;get interrupt 23h vector
                int 21h
                mov old23h_segment,es           ;save it
                mov old23h_offset,bx
                mov ah,25h                      ;point it to an IRET instruction
                mov dx,offset ioexit
                int 21h
                mov ax,3524h                    ;get interrupt 24h vector
                int 21h
                mov old24h_segment,es           ;save it
                mov old24h_offset,bx
                mov ah,25h                      ;then set it to IOERR routine
                mov dx,offset ioerr
                int 21h
                pop es                          ;restore ES
                ret
ioset           endp
;
ioreset         proc near
                mov ax,2524h                    ;restore interrupt 24h vector
                mov dx,old24h_offset
                push ds
                assume ds:nothing
                mov ds,old24h_segment
                int 21h
                mov ax,2523h                    ;restore interrupt 23h vector
                mov dx,old23h_offset
                mov ds,old23h_segment
                int 21h
                mov ax,251Bh                    ;restore interrupt 1Bh vector
                mov dx,old1Bh_offset
                mov ds,old1Bh_segment
                int 21h
                pop ds
                assume ds:code
                ret
ioreset         endp
;
;----------------------------------------------------------------------
;FINISH loads the data file, resets interrupt vectors, and terminates.
;----------------------------------------------------------------------
finish          proc near
;
;Open the specified data file for reading.
;
                mov ax,3D00h                    ;open file for reading
                mov dx,offset filespec          ;point DX to ASCIIZ filespec
                int 21h
                jnc finish3                     ;branch if no error
                mov ah,9                        ;print 'File not found'
                mov dx,offset errmsg1
                int 21h
                cmp reload,0                    ;was this an attempted reload?
                je endfin                       ;no, then exit
                mov al,old_numrec               ;yes, then restore parameters
                mov es:[numrec],al
                mov al,old_recptr
                mov es:[recptr],al
                mov al,old_fileflag
                mov es:[fileflag],al
endfin:         ret                             ;and exit
;
;Load the data file into memory.
;
finish3:        mov bx,ax                       ;transfer file handle to BX
                push ds                         ;exchange DS and ES
                push es
                pop ds
                pop es
                mov ah,3Fh                      ;read record count byte
                mov cx,1
                mov dx,offset numrec
                int 21h
                jc close                        ;branch on error
                mov al,ds:[maxrec]              ;make sure NUMREC <= MAXREC
                cmp al,ds:[numrec]
                jae finish4
                mov ds:[numrec],al              ;adjust if it isn't
finish4:        mov al,ds:[numrec]              ;calculate number of bytes to read
                mul record_length
                mov cx,ax                       ;transfer number of bytes to CX
                mov ah,3Fh                      ;DOS function 3Fh - read file
                mov dx,offset data_buffer       ;point DX to buffer area
                int 21h                         ;read all records from disk
close:          mov ah,3Eh                      ;close file
                int 21h
                mov ds:[fileflag],1             ;set filespec flag
                push ds                         ;swap DS and ES again
                push es
                pop ds
                pop es
;
;Initialize the record index table.
;
finish5:        mov di,offset index_table       ;point DI to table area
                xor al,al                       ;zero AL
                mov cl,es:[maxrec]              ;set counter
                xor ch,ch
                rep stosb                       ;zero all bytes
                mov cl,es:[numrec]              ;set CX to number of records
                xor ch,ch
                jcxz finish7                    ;exit if there are none
                mov di,offset index_table       ;reset DI
                mov al,1                        ;initialize AL
finish6:        stosb                           ;set one index byte
                inc al                          ;increment index
                loop finish6                    ;loop until done
;
;Copy new filespec into old data space if this is a reload.
;
```

```
finish7:        cmp reload,0                    ;is this a reload
                je finish8                      ;no, then branch
                mov si,offset filespec          ;point SI and DI to filespec areas
                mov di,si
                mov cx,128                      ;set counter
                rep movsb                       ;transfer text
                ret                             ;done - exit
;
;Save and replace all required interrupt vectors.
;
finish8:        mov ax,3508h                    ;get interrupt 8 vector
                int 21h
                mov old8h,bx                    ;save it
                mov old8h[2],es
                mov ah,25h                      ;point it to the TIMER routine
                mov dx,offset timer
                int 21h
                mov ax,3509h                    ;get interrupt 9 vector
                int 21h
                mov old9h,bx                    ;save it
                mov old9h[2],es
                mov ah,25h                      ;point it to KEYBOARD routine
                mov dx,offset keyboard
                int 21h
                mov ax,3510h                    ;get interrupt 10h vector
                int 21h
                mov old10h,bx                   ;save it
                mov old10h[2],es
                mov ah,25h                      ;point it to VIDEO
                mov dx,offset video
                int 21h
                mov ax,3513h                    ;get interrupt 13h vector
                int 21h
                mov old13h,bx                   ;save it
                mov old13h[2],es
                mov ah,25h                      ;point it to BDISK
                mov dx,offset bdisk
                int 21h
                mov ax,3528h                    ;get interrupt 28h vector
                int 21h
                mov old28h,bx                   ;save it
                mov old28h[2],es
                mov ah,25h                      ;point it to BACKPROC
                mov dx,offset backproc
                int 21h

 Calculate amount of memory to reserve and terminate-but-stay-resident.

                mov dx,offset program           ;display notice and hot key
                mov ah,9                        ;with DOS function 9
                int 21h
                mov al,maxrec                   ;get max number of records
                mul record_length               ;multiply by 102
                mov dx,ax                       ;transfer figure to DX

                add dx,(offset data_buffer - offset code + 15)

                mov cl,4                        ;convert bytes to paragraphs
                shr dx,cl
                mov ax,3100h                    ;load function and return codes
                int 21h                         ;terminate-but-stay-resident
finish          endp
;
;----------------------------------------------------------------------
;Data space to be used after Cardfile is resident in memory.
;----------------------------------------------------------------------
pc              = $
screen_buffer   = pc                            ;video memory buffer
pc              = pc + 10 * 44 * 2
index_table     = pc                            ;record index table
pc              = pc + [illegible]
filespec        = pc                            ;file specification
pc              = pc + 128
data_buffer     = pc                            ;record buffer
;
;----------------------------------------------------------------------
;INITIALIZE prepares the program for residency.
;----------------------------------------------------------------------
initialize      proc near
                assume ds:code
errmsg1         db 13,10,"File not found",13,10,"$"
errmsg2         db 13,10,"Critical Error Flag not found",13,10,"$"
old_numrec      db ?
old_recptr      db ?
old_fileflag    db ?
;
;See if the program is already resident in memory.
;
init1:          mov word ptr [begin],0          ;zero word to avoid false match
                xor bx,bx                       ;initialize search segment
                mov ax,cs                       ;record current segment in AX
init2:          inc bx                          ;increment search segment
                cmp ax,bx                       ;reached current segment?
                je init3                        ;yes, then this is the first load
                mov es,bx                       ;point ES to search segment
                mov si,offset begin             ;point SI and DI to ID offset
                mov di,si
                mov cx,16                       ;check 16 characters
                cld                             ;clear DF
                repe cmpsb                      ;compare the strings
                jne init2                       ;continue search if compare failed
;
;Cardfile is already installed.  Set the reload flag and save parameters.
;
                mov reload,1                    ;set flag
                mov al,es:[numrec]              ;save parameters
                mov old_numrec,al
                mov al,es:[recptr]
                mov old_recptr,al
                mov al,es:[fileflag]
                mov old_fileflag,al
                mov es:[numrec],0               ;initialize counters and flags
```

(CARDFILE.ASM continues)

```
               mov es:[recptr],1
               mov es:[fileflag],0
               jmp short parse                         ;branch to parsing code
;
;Determine which version of DOS is running.
;
init3:         mov ah,30h                      ;DOS function 30h
               int 21h
               mov dos_version,al              ;major version number
;
;Get and save the address of the INDOS flag.
;
               mov ah,34h                      ;function 34h
               int 21h                         ;get address
               mov dos_segment,es              ;save segment
               mov indos_offset,bx             ;save offset
;
;Get and save the address of the critical error flag.
;
               mov ax,3E80h                    ;CMP opcode
               mov cx,2000h                    ;max search length
               mov di,bx                       ;start at INDOS address
init4:         repne scasw                     ;do the search
               jcxz init5                      ;branch if search failed
               cmp byte ptr es:[di+5],0BCh     ;verify this is it
               je found                        ;branch if it is
               jmp init4                       ;resume loop if it's not
init5:         mov cx,2000h                    ;search again
               inc bx                          ;search odd addresses this time
               mov di,bx
init6:         repne scasw                     ;look for the opcode
               jcxz notfound                   ;not found if loop expires
               cmp byte ptr es:[di+5],0BCh     ;verify this is it
               je found
               jmp init6
notfound:      mov ah,9                        ;flag not found
               mov dx,offset errmsg2
               int 21h
               ret
found:         mov ax,es:[di]                  ;get flag offset address
               mov errflag_offset,ax           ;save it
               push cs                         ;reset ES to the code segment
               pop es
;
;Parse the command line and create a complete filespec.
;
parse:         mov di,82h                      ;point DI to command line text
               cmp byte ptr [di-2],2           ;less than 2 characters entered?
               jnb parse0                      ;no, then continue
               jmp finish5                     ;yes, then skip load routine
parse0:        mov si,di                       ;point SI to command line text
               mov di,offset filespec          ;point DI to buffer
parse1:        cmp byte ptr [si],32            ;advance to first non-space
               jne parse2
               inc si
               jmp parse1
parse2:        cmp byte ptr [si+1],":"         ;leading drive specifier?
               je parse4                       ;yes, then filespec is complete
               mov ah,19h                      ;get current drive
               int 21h
               add al,65                       ;convert to ASCIIZ
               mov ah,":"                      ;complete drive specifier
               mov word ptr [di],ax            ;write drive spec to buffer
               add di,2                        ;advance DI
               cmp byte ptr [si],"\"           ;leading backslash?
               je parse4                       ;yes, then filespec is complete
               mov byte ptr [di],"\"           ;fill in the backslash
               inc di
               push si                         ;save SI and DI
               push di
               mov ah,47h                      ;get current path
               mov si,di
               xor dl,dl                       ;default drive
               int 21h                         ;append path to drive spec
               pop di                          ;restore SI and DI
               pop si
               cmp byte ptr [di],0             ;anything returned?
               je parse4                       ;no, then filespec is complete
parse3:        inc di                          ;advance to end of string
               cmp byte ptr [di],0
               jne parse3
               mov byte ptr [di],"\"           ;insert trailing backslash
               inc di
parse4:        mov al,[si]                     ;append entry to filespec string
               cmp al,13
               je parse5
               mov [di],al
               inc si
               inc di
               jmp parse4
parse5:        mov byte ptr [di],0
               jmp finish                      ;load data file and exit
initialize     endp
;
code           ends
               end begin
```

(CARDFILE.ASM ends)

with a series of instructions to force several modem parameters to a known state. Since CARDFILE must be as unobtrusive as possible, and since the procedure required to query a Smartmodem for its status varies even across the Hayes product line, CARDFILE must accept the modem state it finds when it pops up. In all but the most extreme circumstances (if you were to interrupt an on-line transmission and issue a dial command with the modem not in command mode, for example), this will present no problems at all.

CARDFILE is initially configured for a 1200-baud (technically, 1200 bps, but I'll use the conventional term "baud" in this article) modem connected to the COM1 serial port. If you're set up otherwise, you can use DEBUG to make the changes necessary to make CARDFILE compatible with your system. It's a painless process I'll discuss in detail later on.

INSIDE CARDFILE CARDFILE hooks into three interrupts (8, 9, and 28h) to enable it to pop up. Interrupt 8 is the primary timer interrupt, which is generated roughly 18 times per second under normal circumstances by the 8253 programmable timer chip on the system board. Interrupt 9 is generated by a dedicated microprocessor inside the keyboard. It alerts the main CPU when any key is pressed or released. Interrupt 28h is DOS's background process interrupt. Under the proper circumstances, it lets a TSR bypass what Microsoft calls the INDOS flag, which is used to signal that DOS is busy executing a process.

■ Since CARDFILE must be as unobtrusive as possible, it must accept the modem state it finds when it pops up.

When the Alt-Right Shift key combination is detected by the new interrupt 9 handler, a flag labeled REQUEST_FLAG in the source code is initialized to 18. REQUEST_FLAG does double duty as a counter. Every time the timer interrupt handler receives control, it checks the value. If the flag is zero, the interrupt is ended with an IRET. If it's nonzero and either INDOS or the critical error flag is set, REQUEST_FLAG's value is decremented and the interrupt ends. If it's nonzero and both INDOS and the critical error flag are clear, the routine MAIN is called to pop up CARDFILE. If sufficient time (about 1 second) passes after REQUEST_FLAG is set and CARDFILE is unable to work its way around the internal flags, the counter expires and the request to invoke CARDFILE is nullified.

The interrupt 28h handler does the same sort of thing. It doesn't have to check the status of INDOS, but it does look at the critical error flag. Remember that interrupt 28h is a signal passed from certain DOS functions indicating that INDOS is set but that it's nonetheless all right to use interrupt 21h if certain restrictions are observed. Since the state of the critical error flag doesn't influence interrupt 28h (the low-numbered DOS services that generate it, in fact, can be called inside a critical error handler), the interrupt 28h handler must check the flag independently.

CARDFILE maintains its own internal flags to track the status of interrupts 13h and 10h. Interrupt 10h is the BIOS video interface. The window won't come up if either of the flags is set, for fear of interrupting a disk seek or a series of I/O calls to video adapter ports. Notice that the inter-

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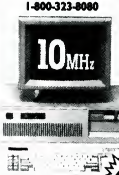

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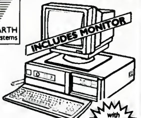

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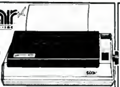

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CIRCLE 528 ON READER SERVICE CARD

```
100 REM -- BASIC PROGRAM TO CREATE cardfile.COM
110 OPEN "cardfile.COM" AS #1 LEN = 1:FIELD #1,1 AS A$
120 CLS:LOCATE 1,1:PRINT "Creating CARDFILE.COM"
130 PRINT "Lines to go:":CHECKSUM = 0
140 FOR I = 1 TO 492
150    LINESUM = 0:LOCATE 2,13:PRINT USING "###";492-I
160    FOR J = 1 TO 8
170       READ BYTE
180       CHECKSUM = CHECKSUM + BYTE
190       LINESUM = LINESUM + BYTE
200       IF (BYTE < 256) THEN LSET A$ = CHR$(BYTE)
210       PUT #1
220    NEXT J
230    READ LINECHECK
240    IF LINECHECK <> LINESUM THEN PRINT "Error in Line";280 + 10 * I
250 NEXT I
260 CLOSE
270 IF CHECKSUM = 380408! THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!" : END
290 DATA    233,    95,    14,    67,    97,   114,   100,   102,   820
300 DATA    105,   108,   101,    32,    49,    46,    48,    32,   521
310 DATA     40,    99,    41,    32,    49,    57,    56,    55,   429
320 DATA     32,    90,   105,   102,   102,    32,    67,   111,   641
330 DATA    109,   109,   117,   110,   105,    99,    97,   116,   862
340 DATA    105,   111,   110,   115,    32,    67,   111,    46,   697
350 DATA     13,    10,    72,   111,   116,   107,   101,   121,   651
360 DATA     32,   105,   115,    32,    65,    76,    84,    45,   554
370 DATA     82,    73,    71,    72,    84,    32,    83,    72,   569
380 DATA     73,    70,    84,    36,    26,    74,   101,   102,   566
390 DATA    102,    32,    80,   114,   111,   115,   105,   115,   774
400 DATA    101,     0,     0,     0,     0,     0,     0,     0,   101
410 DATA      0,     0,     0,     0,     0,     0,     0,     0,     0
420 DATA      0,   255,     1,     0,     0,     0,     0,     0,   256
430 DATA      0,     0,     0,     0,     0,     0,     0,     0,     0
440 DATA      0,     0,     0,     0,     0,     0,     0,     0,     0
450 DATA      0,   192,     0,     0,   131,    65,    84,    68,   540
460 DATA     84,     0,    65,    84,    72,    48,    13,     0,   366
470 DATA    172,     0,   102,     0,     3,    10,   102,     7,   494
480 DATA     79,    10,   111,     0,    32,    78,    97,   109,   516
490 DATA    101,    32,    32,    65,   100,   100,   114,    32,   576
500 DATA     32,    32,    32,    32,    32,    32,    32,    32,   256
510 DATA     32,    32,    32,    32,    32,    80,   104,   111,   455
520 DATA    110,   101,    32,    78,   111,   116,   101,    32,   681
530 DATA     70,    49,    45,    78,   101,   119,    32,    70,   564
540 DATA     50,    45,    69,   100,    32,    70,    51,    45,   462
550 DATA     68,   101,   108,    32,    70,    52,    45,    83,   559
560 DATA     99,   104,    32,    70,    53,    45,    83,   118,   604
570 DATA     32,    70,    54,    45,    68,   105,    97,   108,   579
580 DATA      0,    80,   114,   101,   115,   115,    32,    69,   626
590 DATA     78,    84,    69,    82,    32,   116,   111,    32,   604
600 DATA    100,   101,   108,   101,   116,   101,    44,    32,   703
610 DATA     69,    83,    67,    32,   116,   111,    32,    97,   607
620 DATA     98,   111,   114,   116,     0,    80,   114,   101,   734
630 DATA    115,   115,    32,    70,    49,    32,   116,   111,   640
640 DATA     32,   118,    97,   108,   105,   100,    97,   116,   773
650 DATA    101,    32,   110,   101,   119,    32,   101,   110,   706
660 DATA    116,   114,   121,     0,    70,   105,   110,   100,   736
670 DATA     58,     0,    80,   114,   101,   115,   115,    32,   615
680 DATA     69,    78,    84,    69,    82,    32,   116,   111,   641
690 DATA     32,    99,   111,   110,   116,   105,   110,   117,   800
700 DATA    101,    44,    32,    69,    83,    67,    32,   116,   544
710 DATA    111,    32,   101,   110,   100,     0,    83,   101,   638
720 DATA     97,   114,    99,   104,    32,   107,   101,   121,   775
730 DATA     32,   110,   111,   116,    32,   102,   111,   117,   731
740 DATA    110,   100,    46,    32,    80,   114,   101,   115,   698
750 DATA    115,    32,    69,    83,    67,     0,    78,   111,   555
760 DATA     32,   114,   111,   111,   109,    32,   102,   111,   722
770 DATA    114,    32,    97,   100,   100,   105,   116,   105,   769
780 DATA    111,   110,    97,   108,    32,   114,   101,    99,   772
790 DATA    111,   114,   100,   115,     0,    68,   105,   115,   728
800 DATA    107,    32,   102,   117,   108,   108,     0,    80,   654
810 DATA    114,   101,   115,   115,    32,    70,    49,    32,   628
820 DATA    116,   111,    32,   118,    97,   108,   105,   100,   787
830 DATA     97,   116,   101,    32,    99,   104,    97,   110,   756
840 DATA    103,   101,   115,     0,    80,   105,    99,   107,   710
850 DATA     32,   117,   112,    32,   112,   104,   111,   110,   730
860 DATA    101,    32,    97,   110,   100,    32,   112,   114,   698
870 DATA    101,   115,   115,    32,   115,   112,    97,    99,   786
880 DATA    101,    98,    97,   114,     0,    69,   114,   114,   707
890 DATA    111,   114,    32,   115,    97,   118,   105,   110,   802
900 DATA    103,    32,   102,   105,   108,   101,     0,    77,   628
910 DATA    111,   100,   101,   109,    32,   110,   111,   116,   790
920 DATA     32,   114,   101,    97,   100,   121,     0,    70,   635
930 DATA    105,   108,   101,    58,     0,     0,     0,     0,   372
940 DATA      0,     0,     0,     0,     0,     0,     0,     0,     0
950 DATA      0,     0,     0,     0,     0,     0,     0,     0,     0
960 DATA      0,     0,     0,     0,     0,     0,     0,     0,     0
970 DATA      0,     0,     0,     0,     0,     0,   184,    31,   215
980 DATA    118,   110,   111,     0,   176,   112,     7,     7,   633
990 DATA      7,    44,    40,    45,    41,    42,    45,    38,   266
1000 DATA    81,    87,    69,    82,    84,    89,    85,    73,   650
1010 DATA    79,    80,     0,     0,     0,     0,    65,    83,   307
1020 DATA    68,    70,    71,    72,    74,    75,    76,     0,   506
1030 DATA     0,     0,     0,     0,    90,    88,    67,    86,   331
1040 DATA    66,    78,    77,   251,   158,    45,   255,    30,   958
1050 DATA     9,     3,    80,   180,     2,   205,    22,    36,   537
1060 DATA    15,    60,     9,    88,   117,    14,    46,   128,   477
1070 DATA    82,    95,     1,     0,   117,     8,    46,   198,   625
1080 DATA     8,    98,     1,    16,   207,   156,    46,   255,   787
1090 DATA    30,     5,     3,    46,   128,    62,    98,     1,   373
1100 DATA     0,   118,    50,    46,   128,    62,    96,     1,   505
1110 DATA     0,   117,    51,    46,   128,    62,    97,     1,   502
1120 DATA     0,   117,    43,     0,    97,    48,   142,     0,   447
1130 DATA    80,     1,    48,   139,    62,    91,     1,    38,   467
1140 DATA   128,    61,     0,   117,    23,    46,   139,    62,   576
1150 DATA    93,     1,    30,   128,    61,     0,   117,    12,   460
1160 DATA    85,     7,    46,   198,     0,    90,     1,     0,   451
1170 DATA   232,   110,     0,   207,    95,     7,    46,   254,   951
1180 DATA    14,    98,     1,   207,   156,    46,   254,     0,   782
1190 DATA    86,     1,    46,   255,    30,    13,     3,    48,   490
1200 DATA   254,    14,    96,     1,   207,   156,    46,   254,  1028
1210 DATA     8,    97,     1,    48,   255,    30,    17,     3,   455
1220 DATA   158,    48,   254,    14,    97,     1,   157,   202,   927
1230 DATA     2,     0,   156,    48,   255,    30,    21,     3,   513
1240 DATA    46,   128,    62,    88,     1,     0,   118,    45,   496
1250 DATA    48,   128,    62,    98,     1,     0,   117,    37,   487
1260 DATA    46,   128,    62,    97,     1,     0,   117,    29,   480
1270 DATA     0,    87,    46,   142,     0,    80,     1,    46,   423
1280 DATA   139,    62,    83,     1,    36,   128,    61,     0,   522
1290 DATA    96,     7,   117,     0,    46,   198,     0,    98,   576
1300 DATA     1,     0,   232,     4,     0,   207,   178,     3,   623
1310 DATA   207,    46,   188,     0,    85,     1,     1,   250,   804
1320 DATA    48,   140,    22,    88,     1,    46,   137,    38,   529
1330 DATA   101,     1,    14,    23,   188,   152,    28,   251,   760
1340 DATA    88,    83,    81,    82,    86,    87,    30,     0,   535
1350 DATA    85,   180,    18,   205,    16,    60,     3,   118,   682
1360 DATA    32,    68,     7,   118,    28,    83,     7,    31,   374
1370 DATA    95,    94,    88,    89,    61,    86,   250,    46,   843
1380 DATA   142,    22,    89,     1,    48,   139,    38,   101,   588
1390 DATA     1,   251,    46,   188,     0,    86,     1,     0,   598
1400 DATA   195,    14,    31,   184,    64,     0,   142,   192,   822
1410 DATA    38,   131,    62,    74,     0,    80,   114,   213,   712
1420 DATA   138,    62,   115,     1,   180,     3,   205,    16,   718
1430 DATA   137,    14,   118,     1,   137,    22,   118,     1,   546
1440 DATA    38,   139,    22,    88,     0,    82,   176,    14,   578
1450 DATA   238,    68,   236,   139,   224,    74,   176,    15,  1187
1460 DATA   238,    66,   236,   163,   128,     1,   180,    10,  1022
1470 DATA   179,    16,   205,    16,   128,   251,    16,   116,   827
1480 DATA    43,    38,   246,     0,   135,     0,     0,   117,   583
1490 DATA    36,   198,     6,   108,     1,     2,    83,   184,   617
1500 DATA    48,    17,   205,    16,   254,   201,   138,   233,  1112
1510 DATA   128,   237,     2,   137,    14,   122,     1,   190,   831
1520 DATA    37,     3,    81,    10,   205,   116,    44,   190,   746
1530 DATA    43,     3,   235,    30,    30,   247,     0,    99,   710
1540 DATA     0,    64,     0,   118,    16,   198,     0,   108,   508
1550 DATA     1,     1,   189,     6,   122,     1,     7,     6,   343
1560 DATA   198,    37,     3,   236,    14,   198,     6,   106,   791
1570 DATA     1,     0,   189,     0,   122,     1,    12,    11,   352
1580 DATA   198,    43,     3,    14,     7,   191,   109,     1,   556
1590 DATA   185,     3,     0,   252,   243,   165,     0,   198,  1052
1600 DATA     6,   127,     1,     0,   128,    62,   124,     1,   449
1610 DATA     2,   117,    33,   142,     6,    89,     1,   139,   529
1620 DATA    82,    91,     1,    30,   128,    61,     0,   115,   497
1630 DATA    10,   139,    62,    83,     1,    36,   128,    61,   541
1640 DATA     0,   117,     0,    30,   188,     5,     1,   188,   566
1650 DATA     6,   127,     1,     1,   180,    81,   205,    33,   634
1660 DATA   137,    30,   103,     1,   180,    88,    14,    81,   636
1670 DATA   205,    33,   128,    82,   127,     1,     0,   116,   872
1680 DATA     0,   130,    82,    83,     1,    30,   198,     5,   544
1690 DATA     0,     7,   232,    86,     0,   128,    62,   108,   601
1700 DATA     1,     1,   117,     3,   232,   125,     5,   232,   716
1710 DATA    14,     1,   232,   112,     1,   128,    62,   108,   658
1720 DATA     1,     1,   117,     3,   232,   124,     5,   180,   663
1730 DATA     1,   181,    32,   205,    16,   128,    62,   107,   732
1740 DATA     1,     0,   116,     3,   232,   246,     0,   232,   830
1750 DATA   110,     5,    10,   162,   110,    19,    80,    13,   533
1760 DATA   117,     9,   128,    62,   107,     1,     2,   114,   540
1770 DATA   238,   235,   105,    60,    27,   117,   232,   235,  1249
1780 DATA   121,   128,   252,    16,   114,   225,   128,   252,  1236
1790 DATA    50,   110,     5,   232,   100,     1,   235,   216,  1056
1800 DATA   128,   252,    59,   114,   210,   128,   252,    64,  1207
1810 DATA   110,    16,   128,   230,    59,   130,   220,    50,   966
1820 DATA   255,   209,   227,    46,   255,   151,   144,     1,  1288
1830 DATA   235,   189,   128,    62,   107,     1,     2,   114,   838
1840 DATA   182,   128,   252,    71,   117,    10,   198,     6,   964
1850 DATA   100,     1,     1,   232,   153,     6,   235,   187,   901
1860 DATA   128,   252,    70,   117,     0,   180,   107,     1,   852
1870 DATA   162,   188,     1,   235,   236,   128,   252,    73,  1196
1880 DATA   117,    13,   254,    14,   186,     1,   128,    82,   696
1890 DATA   188,     1,     0,   117,   222,   235,   230,   128,  1039
1900 DATA   252,    81,   117,   131,   180,   187,     1,    88,   807
1910 DATA     6,   106,     1,   118,     0,   254,     0,   106,   601
1920 DATA     1,   235,   200,   190,     0,   100,     1,     1,   748
1930 DATA   235,   193,   180,    80,   139,    30,   103,     1,   981
1940 DATA   205,    33,   232,   175,     7,   128,    62,   108,   968
1950 DATA     1,     1,   117,     3,   232,   181,     4,   232,   771
1960 DATA   141,     0,   128,    82,   100,     1,     1,   117,   658
1970 DATA     3,   232,   183,     4,   180,     2,   130,    82,   804
1980 DATA   115,     1,   138,    22,   118,     1,   205,    16,   617
1990 DATA    98,   139,    14,   120,     1,   178,    14,   238,   792
2000 DATA    86,   139,   197,   238,    74,   178,    15,   238,  1142
2010 DATA    86,   138,   193,   238,   128,    62,   108,     1,   934
2020 DATA     2,   117,     0,   232,   241,     5,   233,   236,  1073
2030 DATA   253,   180,     1,   139,    14,   118,     1,   205,   888
2040 DATA    15,   233,   225,   253,     0,     0,     0,     0,   727
2050 DATA    30,   184,    64,     0,   142,   218,   161,    74,   871
2060 DATA     0,    48,   153,   124,     0,    46,   131,    48,   562
2070 DATA   124,     0,    44,    46,   209,    30,   124,     8,   597
2080 DATA   179,     0,   246,   227,   209,   224,     5,    38,  1132
2090 DATA     0,   138,   248,     3,    54,    78,     0,    46,   560
2100 DATA   137,    54,   126,     6,    46,   142,    30,   109,   650
2110 DATA     1,   161,    40,    18,   188,    10,     0,    81,   823
```

(continues)

CARDFILE.BAS: *A BASIC program that will automatically create CARDFILE.COM.*

```
2120 DATA  165,  44,   0, 243, 185,  89,  40,   3,  776
2130 DATA   54, 124,   8, 225, 242,  31, 195,   8,  884
2140 DATA  139,  82, 128,   0, 142,   5, 100,   1,  591
2150 DATA  190,  40,  15, 105,  10,   0,  91, 185,  798
2160 DATA   44,   0, 243, 165,  89,   3,  82, 124,  730
2170 DATA    8, 228, 243,   7, 195,   0, 142,   6,  831
2180 DATA  109,   1, 139,  82, 128,   8, 178, 218,  837
2190 DATA  138,  30, 111,   1, 171, 175, 190, 185, 1010
2200 DATA   42,   0, 243, 171, 176, 191, 171,   3,  997
2210 DATA   82, 124,   8, 198, 160,   1, 166,   0,  730
2220 DATA    0,  81, 232,  77,   0,   3,  82, 124,  579
2230 DATA    8,  89, 228, 248, 176, 179, 171,  80, 1172
2240 DATA  176,  32, 136,  38, 112,   1, 171,  80,  748
2250 DATA  176, 196, 185,  40,   0, 243, 171,  88, 1080
2260 DATA  171,  86, 171,   3,  82, 124,   0, 171,  798
2270 DATA   60, 176,  32, 138,  38, 113,   1, 171,  749
2280 DATA   60, 190, 192,   1, 185,  40,   0, 172,  850
2290 DATA  171, 228, 252,  80, 171,  80, 171,   3, 1170
2300 DATA   82, 124,   8, 176, 192, 171, 176, 196, 1103
2310 DATA  165,  42,   0, 243, 171, 175, 217, 171, 1208
2320 DATA    7, 165, 175, 178, 130,  30, 111,   1,  845
2330 DATA  171,  80, 185,   8,   8, 130,  38, 112,  738
2340 DATA    1, 172, 171, 226, 252, 176,  32, 171, 1201
2350 DATA  171, 136,  30, 114,   1, 165,  34,   0,  661
2360 DATA  243, 171,  88, 171, 180, 128,  82, 107, 1165
2370 DATA    1,   2, 114,  47, 136, 105,  44,  10,  558
2380 DATA  107,  85,   3, 215, 136, 206, 130,  14,  959
2390 DATA  107,   1,  80, 237, 170,   1,  80,  81,  733
2400 DATA  232,   5,   5,  58,  21,  89,  88, 115,  611
2410 DATA    8, 254, 102, 228, 241, 254, 200,  50, 1431
2420 DATA    0, 166,   1, 110,   0, 102, 100,   1,  504
2430 DATA  232, 204,   4, 195,   0,   0, 128,  62,  825
2440 DATA  107,   1,   6, 116,  20, 190,  44,   2,  460
2450 DATA  232, 250,   4,  51, 255, 188,  28,  14, 1018
2460 DATA  177,  32, 232,  43,   5,  10, 201, 117,  817
2470 DATA    7, 190, 102,   1, 232, 230,   4, 195, 1061
2480 DATA  138,  14, 100,   7, 101,  33,  42, 233,  625
2490 DATA  138,  46, 101,   7, 150, 188,   1, 138,  775
2500 DATA   14, 107,   1,  50, 237,  80,  81, 232,  802
2510 DATA  174,   4, 100,   6,   0,  81,  87, 130,  675
2520 DATA   14, 101,   7,  50, 237,  81,  87, 130,  795
2530 DATA   14, 100,   7,  50, 237,  81, 248, 172,  957
2540 DATA   30, 223,  38, 136,  20, 128, 227, 223, 1042
2550 DATA   71,  58, 165, 117,  42, 228, 249, 131, 1080
2560 DATA  196,  10,  86,  80, 136,  14, 107,   1,  534
2570 DATA   50, 237,  65,  81, 102, 186,   1, 232,  934
2580 DATA   85,   4, 100,  50,   2, 232, 141,   4,  706
2590 DATA  232, 213,   2,  50,  13, 115,  20,  50,  718
2600 DATA   27, 117, 245,  80,  88, 235, 140,  95, 1042
2610 DATA   60,  71, 220, 165,  95,  89, 131, 199, 1085
2620 DATA   32, 228, 170,  86,  86,  58,   8, 107,  776
2630 DATA    1, 116,   4, 254, 102, 235,   2, 176,  980
2640 DATA    1, 226, 148, 190,  88,   2, 232,  92,  975
2650 DATA    4, 232, 104,   2,  60,  27, 117, 240,  856
2660 DATA  233, 102, 255,   0,   0,   0,   0, 120,  718
2670 DATA   52, 107,   1,   0, 117,   1, 195, 130,  622
2680 DATA   54, 130,   1, 209, 230,   8, 104,  54,  870
2690 DATA    0, 142, 102,  38, 139, 148,   0,   0,  659
2700 DATA    7,  11, 210, 116, 233, 131, 104,   3,  908
2710 DATA   82, 235, 102, 107,   0,  12, 128, 238,  973
2720 DATA  131, 234,   3, 230, 102, 100,   8,  58,  846
2730 DATA  230, 102, 100,   0, 160, 107,   0,  30,  825
2740 DATA  127, 131, 104,   2, 238, 131, 234,   2, 1050
2750 DATA  230, 102, 110,   0, 100,   0, 158, 132,  960
2760 DATA    1, 130,  22, 130,   1, 205,  20, 190,  706
2770 DATA  133,   1, 232, 148,   8, 248, 198, 120, 1082
2780 DATA  117,  84, 100, 186,   1, 232, 208,   3,  881
2790 DATA  139, 247, 129, 190, 120,   0, 165,  32, 1056
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2810 DATA  114,  13,  60,  57, 119,   9, 188,   1,  653
2820 DATA  205,  20, 240, 190, 128, 117,  17, 228, 1155
2830 DATA  232, 104,  59,   1, 205,  20, 104,  13,  860
2840 DATA    1, 205,  20, 240, 105, 128, 116,  10,  926
2850 DATA  100, 239,   2, 232, 103,   3, 232, 255, 1335
2860 DATA    1,  60,  27, 117, 240, 235,  20, 144,  862
2870 DATA  190, 160,   2, 232, 107,   3, 232, 230, 1253
2880 DATA    1,  60,  32, 117, 240, 100, 136,   1,  786
2890 DATA  130,  22, 130,   1, 232,  48,   0, 165,  757
2900 DATA    0, 128, 220, 254,  60, 170, 120, 230, 1240
2910 DATA  131, 234,   3, 150, 106,   8, 238,  55,  846
2920 DATA  150, 109,   0, 238, 131, 104,   2,  50,  802
2930 DATA  192, 238, 131, 234,   2, 180, 118,   8, 1078
2940 DATA  230, 131, 104,   2, 160, 107,   0, 236, 1076
2950 DATA  190, 102,   1, 232, 163,   3, 195, 172, 1066
2960 DATA   10, 192, 118,   9, 180,   1, 205,  20,  733
2970 DATA  240, 195, 120, 116, 242, 105, 120,  62, 1313
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3080 DATA  232,   2,   3, 232,  74,   1,  60,  27,  631
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3180 DATA  116,  42, 190, 233,   1, 232, 173,   2,  989
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3290 DATA  177,  34, 232, 147,   2,  10, 201, 118,  910
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3330 DATA   51, 201, 205,  33, 114, 207, 130, 218, 1160
3340 DATA  160,  64, 165,   1,   8, 160, 107,   1,  724
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3360 DATA   66, 175,   1, 136,  14, 107,   1,  50,  553
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3380 DATA  165, 102,   0, 180,  64, 205,  33, 139,  998
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3790 DATA  252,  77, 117,  10, 128, 250,  50, 110, 1014
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4170 DATA   60, 120, 110, 220,  58,  14, 247,  12,  865
4180 DATA  116, 223, 170,  61, 160,  10, 165,   1,  906
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(CARDFILE.BAS continues)

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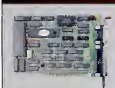

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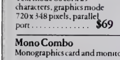

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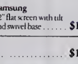

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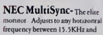

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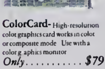

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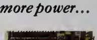

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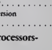

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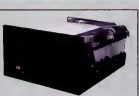

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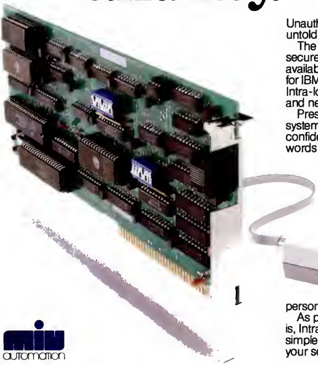

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4190 DATA   0,  205,   16,  254,  104,  180,    2,  205, 1066
4200 DATA  16,   89,  254,  193,  236,  203,   10,  201, 1201
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4540 DATA  33,  114,   28,  180,  186,    1,   58,    0,  585
4550 DATA 187,    1,  115,    3,  182,  107,    1,  160,  656
4560 DATA 107,    1,  246,   39,  120,    1,  139,  200,  861
4570 DATA 180,   83,  186,   24,   21,  205,   33,  180,  892
4580 DATA  82,  205,   33,  198,    0,  128,    1,    1,  634
4590 DATA  30,    6,   31,    7,  181,  152,   10,   50,  465
4600 DATA 182,   30,  130,   14,  105,    1,   50,  237,  775
4610 DATA 243,  170,   30,  130,   14,  107,    1,   50,  761
4620 DATA 237,  227,   10,  191,  182,   16,  176,    1, 1012
4630 DATA 170,  254,  192,  226,  251,  128,   82,  126, 1409
4640 DATA   1,    0,  116,   11,  180,  162,   20,  139,  620
4650 DATA 254,  105,  126,    0,  243,  164,  196,  184, 1351
4660 DATA   0,   53,  205,   33,  137,   30,    5,    3,  474
4670 DATA 140,    6,    7,    3,  180,   37,  186,  125,  684
4680 DATA   3,  205,   33,  184,    9,   53,  205,   33,  725
4690 DATA 137,   30,    9,    3,  140,    0,   11,    3,  330
4700 DATA 180,   37,  186,   91,    3,  205,   33,  184,  916
4710 DATA  16,   83,  205,   33,  137,   30,   13,    3,  490
4720 DATA 140,    6,   15,    3,  180,   37,  188,  204,  771
4730 DATA   3,  205,   33,  184,   19,   63,  205,   33,  735
4740 DATA 137,   30,   17,    3,  140,    0,   19,    3,  355
4750 DATA 180,   37,  186,  221,    3,  205,   33,  184, 1049
4760 DATA  40,   63,  208,   33,  137,   30,   21,    3,  622
4770 DATA 140,    6,   23,    3,  180,   37,  186,  242,  817
4780 DATA   3,  205,   33,  180,    3,    1,  180,    9,  628
4790 DATA 205,   33,  188,  185,    1,  246,   30,  129,  917
4800 DATA   1,  139,  200,  120,  184,   30,   21,  177,  908
4810 DATA   4,  211,  234,  184,    0,   49,  205,   33,  920
4820 DATA  13,   10,   70,  105,  108,  101,   32,  110,  549
4830 DATA 111,  116,   32,  102,  111,  117,  110,  100,  799
4840 DATA  13,   10,   36,   13,   10,   67,  114,  105,  368
4850 DATA 116,  105,   99,   97,  108,   32,   69,  114,  740
4860 DATA 114,  111,  114,   32,   70,  108,   97,  103,  749
4870 DATA  32,  110,  111,  116,   32,  102,  111,  117,  731
4880 DATA 110,  100,   13,   10,   36,    0,    0,    0,  269
4890 DATA 199,    6,    0,    1,    0,    0,   51,  219,  476
4900 DATA 140,  200,   87,   69,  105,  116,   81,  142,  988
4910 DATA 106,  190,    0,    1,  139,  254,  186,   16,  980
4920 DATA   0,  252,  243,  166,  117,  236,  190,    6, 1210
4930 DATA 128,    1,    1,   30,  160,  107,    1,  162,  600
4940 DATA  83,   15,   30,  180,  180,    1,  162,   84,  668
4950 DATA  15,   38,  180,  128,    1,  162,   95,   16,  614
4960 DATA  30,  198,    6,  107,    1,    0,   30,  190,  586
4970 DATA   6,  106,    1,    1,   30,  190,    6,  128,  464
4980 DATA   1,    0,  235,   75,  180,   48,  205,   33,  777
4990 DATA 182,  124,    1,  180,   52,  205,   33,  140,  887
5000 DATA   6,   89,    1,  137,   30,   81,    1,  184,  530
5010 DATA 120,   82,  106,    0,   32,  139,  251,  242, 1039
5020 DATA 175,  227,    0,   30,  120,  125,    5,  188,  895
5030 DATA 116,   29,  235,  243,  165,    0,   32,   67,  987
5040 DATA 139,  251,  242,  175,  227,    0,   30,  120, 1200
5050 DATA 125,    5,  188,  116,   10,  236,  243,  180, 1102
5060 DATA   0,  186,   50,   16,  205,   33,  195,   38,  740
5070 DATA 130,    5,  163,   93,    1,   14,    7,  101,  613
5080 DATA 130,    0,  120,  125,  254,    2,  115,    3,  757
5090 DATA 233,  113,  254,  139,  247,  101,  152,   20, 1340
5100 DATA 128,   60,   32,  117,    3,   70,  235,  240,  893
5110 DATA 128,  124,    1,   50,  116,   49,  180,   25,  681
5120 DATA 208,   33,    4,   65,  180,   50,  137,    5,  687
5130 DATA 131,  199,    2,  120,   60,   92,  116,   31,  750
5140 DATA 198,    5,   92,   71,   66,   87,  180,   71,  790
5150 DATA 139,  247,   50,  216,  205,   33,   95,   84, 1073
5160 DATA 128,   61,    0,  116,   10,   71,  120,   61,  576
5170 DATA   0,  117,  250,  199,    5,   82,   71,  136,  871
5180 DATA   4,   66,   13,  116,    0,  136,    5,   70,  410
5190 DATA  71,  236,  244,  199,    5,    0,  233,  176, 1164
5200 DATA 253,    0,    0,    0,    0,    0,    0,    0,  253
```

(CARDFILE.BAS ends)

rupt 13h routine is defined for the assembler as a FAR procedure, and that exit is achieved through a RET 2 instruction rather than an IRET. The reason is that this interrupt returns status information in the carry flag. An IRET restores the flags register to the state it was in when INT was processed; RET 2 (a FAR return with one word discarded from the stack) leaves it intact.

CARDFILE takes the precaution of resetting the interrupt 1Bh, 23h, and 24h vectors to internal routines each time it is popped up. The 24h handler is a simple one that works only with DOS 3.*x*, which, in its infinite wisdom, provides the option for a custom critical error handler to instruct DOS to fail the call in progress. DOS 2.*x* has no direct analogy. The 1Bh and 23h vectors are changed to point at an IRET, essentially disabling any underlying interrupt code for the time being.

To ensure system integrity, CARDFILE immediately switches to an internal stack when it assumes control. The contents of SS and SP are saved before the switch so the original stack can be restored when CARDFILE is done. Interrupts are disabled before the stack registers are altered to prevent an interrupt from occurring after SS is loaded but before SP is modified. During that short time interval, the entire system is vulnerable because SS:SP points to a random location. Although the 8088 has built-in logic to automatically disable interrupts for one instruction after loading the segment register SS, a bug in some versions of the chip makes the service unreliable.

The SP register is loaded with the offset of the FILESPEC area, where the path to and name of the CARDFILE data file is stored. While it might seem at first glance that the stack will overwrite the filespec string, in reality, the string isn't threatened. That's because in the Intel scheme of things the stack grows downward in memory rather than upward. When a PUSH instruction is executed, SP is decremented by two, and the contents of the indicated register or memory location are transferred to the word addressed by SS:SP. CARDFILE sets aside 512 bytes between the beginning of the area reserved for the index table and the filespec area. The index table uses only the lower 256 bytes; the upper 256 are intended for use by the stack.

■ CARDFILE employs an indexed database structure to aid in the expedition of processing.

CARDFILE activates its own PSP to isolate its file I/O activities. The DOS_VERSION variable is set at initialization time. If it detects that it is running under 2.*x*, CARDFILE temporarily forces the critical error flag high if INDOS is set before calling DOS function 51h.

RECORD STRUCTURE CARDFILE employs an indexed database record structure to aid in the expedition of processing. Normally we think of an alphabetized list as one whose records are arranged physically so that A's come before B's, B's before C's, and so on. But in an indexed set, the physical order of the records is insignificant; each record has a tag attached to it that denotes its relative position. Consider, for example, the following list:

3	San Francisco
1	Los Angeles
2	New York

The number to the left of each string represents its tag byte. Since the tag byte keeps a record of the order of each member of the set, we can arrange the strings any way we like in memory without destroying the alphabetization. And the order can be manipulated simply by changing the tag bytes rather than shuffling the strings themselves. In a system like CARDFILE, where each record is 192 bytes in length, the savings in overhead is tremendous.

Consider, for example, what might happen without an indexed system. If you created a new card that should be placed first in the stack, but you already have 200 records in memory that have to be moved up to make room, you've got 37.5K of data to move. In larger databases, the figure could easily be megabytes rather than kilobytes. No matter how fast your machine is, there will be a perceptible delay between the time your entry is finalized and the time the program is ready to accept more. But in an indexed system, the program has only to increment the values of 200 tag bytes. The new card is assigned the first position, and the total amount of time involved is on the order of microseconds.

CARDFILE maintains a 256-byte table of tag bytes in the area labeled INDEX_TABLE in the source code. Each time the records are saved to disk, they're outputted in alphabetical order. CARDFILE creates a new index table consisting simply of consecutive ordered bytes beginning with the value 1 each time it is initialized (or when a new data file is loaded into memory) and assigns the value 0 to empty slots in the table. When a new record is entered, it is copied physically into the 192-byte space that corresponds to the first 0 in the table. And when a record is deleted, its tag byte is set to 0 so that it will no longer be recognized as an entry. The index values of all higher numbered records are decremented by one to fill the gap, and the next card to be created will be assigned the same address as and overwrite the text of the one just deleted.

VIDEO CONSIDERATIONS I've tried to make sure CARDFILE can handle nearly any imaginable video configuration. Switching between dual color and monochrome monitors throws many TSRs for a loop, since many check the video adapter in use only at initialization time, set video parameters accordingly, and assume there's no need to check again. CARDFILE checks the active video adapter every time it pops up and adjusts attributes and video addresses on the fly.

Since CARDFILE opens and closes its window by writing character/attribute pairs directly to video memory, it must be careful in making assumptions about the video memory structure. In the past, programmers could assume that all video displays would be a standard 25 lines by 40 or 80 columns, but that's no longer always true. Many EGA users routinely use 35- and 43-line modes, where page length is increased in proportion to display density. Thus, CARDFILE goes to the BIOS data area to determine the starting address of the video buffer rather than calculating it itself using an assumed page length. And to maintain compatibility with 120-column modes, it bases its estimation of video line addresses on the row length stored in the same area. All contemporary programs, in fact, should follow this example to take full advantage of the newer and more-capable display adapters.

■ I've tried to make sure CARDFILE can handle nearly any imaginable video configuration.

One minor quirk of the EGA BIOS is one its designers built into it to make the adapter cursor compatible with older CGAs. The old color cursor was defined by the alternate on and off illumination of scan lines 6 and 7 (the seventh and eighth scan lines in an 8-line-high character box). The EGA connected to an enhanced color monitor employs a 14-line box. If bit 0 of the EGA_INFO byte at absolute address 0040:0087h is zero and the BIOS receives a call to set the cursor to lines 6 and 7, it assumes you really meant to create an underline cursor and adjusts the scan lines accordingly. If the bit is set to 1, however, the call passes through unscathed.

A TSR that sets its own EGA cursor shape has to be aware of the status of the "cursor emulation" bit. CARDFILE saves the EGA_INFO byte on the stack, turns emulation off, sets the desired cursor shape, and then restores EGA_INFO. It doesn't rely on the underlying application to leave the emulation bit in its default "on" state. But it also has to determine for itself how many scan lines make up each character: the usual 14 lines per character drop to 8 in 35- and 43-line modes. Calling interrupt 10h, function 11h, with AL set to 30h returns the number of scan lines per character in CX. From that CARDFILE determines which lines will comprise an underline cursor.

If you use an EGA, CARDFILE will always leave you with an underline cursor when it is popped down. Due to faulty logic in the EGA BIOS cursor emulation routines, it's the only way to ensure the cursor will be restored in all possible video configurations.

DIALING Everything CARDFILE needs to dial a phone number is contained in the DIAL procedure. Dialing doesn't amount to much more than sending a text string with the dial command and the phone number out to the PC's serial port, then following up with the hangup command. Three things transform this process from a potentially complex ordeal into a relatively painless task: BIOS interrupt 14h, the 8250 UART, and today's intelligent modems.

Before a serial port can be used, it must be initialized to the desired baud rate and data format. Baud rate is related to, but not necessarily identical to, the rate at which bits are asynchronously transmitted or received; data format refers to structure of the data packet in terms of stop bits, data bits, and parity bits. Interrupt 14h provides

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a convenient means of configuring the serial port and of fetching and transmitting individual bytes.

The 8250 Universal Asynchronous Receiver/Transmitter, or UART for short, is the heart of your machine's serial port. It relieves the CPU of the overhead associated with asynchronous communications. The interrupt 14h handling routines deal intimately with the 8250 and its 11 internal registers.

The "smart" in "smart modem" (Hayes or other) refers to the fact that these modems do much more than merely modulate/demodulate the digital and analog signals passed between the computer and the phone lines. They have built-in logic to interpret commands sent from the host and take action based on those commands. Dialing a number with a Hayes Smartmodem, for example, is as simple as sending the ASCII bytes "ATDT" followed by the ASCII text of the phone number, terminated by a carriage return. What was once a tedious and very complex process of manipulating and monitoring various pins on the RS-232 port has been reduced to a simple matter of OUTing a few bytes to an I/O port.

After initializing the UART to operate at 1200 baud with 8 data bits, 1 stop bit, and no parity (a configuration that the Smartmodem senses and adjusts to when transmission begins), CARDFILE transmits the "ATDT" string to grab the modem's attention and to tell it to treat the next incoming string as a phone number. The text of the phone number is picked right out of the record itself and sent to the modem with all nonnumeric characters except commas stripped out. The process is terminated when CARDFILE sends an ASCII semicolon (instructing the modem to return to command mode after dialing) followed by an ASCII 13 (signifying the end of the command string). CARDFILE then enters a loop waiting for the Spacebar to be pressed. It responds to this keystroke by sending the hangup command string "ATH0" followed by a carriage return. This forces the modem to relinquish control of the phone line, leaving your telephone handset in sole possession.

The final step is to restore the UART to its original state. The BIOS initializes the serial port by writing values to four 8250 registers: Divisor LSB, Divisor MSB, Line Control, and Interrupt Enable. Before CARDFILE invokes interrupt 14h, it saves the contents of these registers. Restoring them to their original state is as simple as writing the stored values back out. For a more detailed look at the 8250, its registers, and the registers' functions, refer to the sidebar "Programming the 8250."

The individual bytes are transmitted through the service of interrupt 14h, function 1. Before transferring a byte into the

8250's Transmitter Holding Register for output, the BIOS monitors the Data Set Ready (DSR) and Clear To Send (CTS) bits of the Modem Status Register. If the modem is powered off or otherwise unready to receive data, DSR is never asserted (Hayes Smartmodems leave CTS permanently asserted in asynchronous mode), and the BIOS signals the caller that a timeout is in effect by returning from interrupt 14h with the high bit of AH set. When CARDFILE detects a transmission failure, it branches to the TIME_OUT routine that displays "Modem not ready" and exits.

SEGMENT OVERRIDES If you examine the initialization portion of CARDFILE, you may be puzzled to find explicit segment overrides when named memory locations are referenced. Since the Macro Assemblers' ASSUME pseudo-op normally handles the task of correlating the references and the segment registers, why does CARDFILE supervene?

This section of the code handles two functionally similar but mechanically different tasks that depend upon whether CARDFILE is already installed.

> ■ If the modem is powered off or otherwise unready to receive data, the BIOS signals the caller that a time-out is in effect.

(1) If CARDFILE is being installed for the first time, the DOS version is checked, INDOS and the critical error flag are located, a data file is loaded (if one was specified on the command line), the index table is built, interrupt vectors are reset, and the code becomes resident. For these tasks the segment overrides *are* meaningless; they're simply redundant assertions of what ASSUME will do anyway.

(2) However, if CARDFILE is subsequently invoked from the command line to load a new data file, it sets an internal flag called RELOAD that helps it navigate through the file-loading portions of the code without executing the rest. In this case, since a copy of CARDFILE, complete with its own data space and memory variables, already exists in memory, the segment overrides ensure that the contents of the original CARDFILE, and not the one currently executing, are affected. If a new data file containing two fewer records than the current one is loaded, for example, the NUMREC variable in the first copy of CARDFILE must be changed to reflect the new number of entries. Letting

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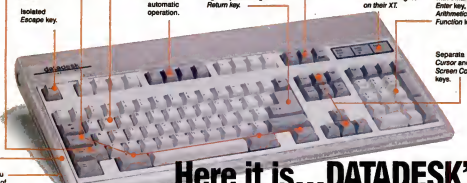
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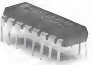

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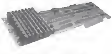

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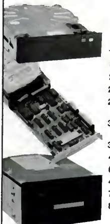

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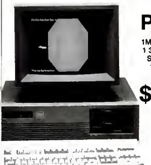

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PROGRAMMING THE 8250

The 8250 UART helps transform the otherwise complex process of performing asynchronous I/O into one transparent to the main CPU. It takes care of the timing issues involved, as well as the assembly of complete bytes of data from streams of incoming data bits, start bits, stop bits, and parity bits. It also does the reverse, taking each byte sent to it and building a "frame" that represents the original data plus the associated asynchronous control bits.

The 11 internal registers of the 8250 make it configurable for almost any mode of serial communications. The IBM PC maps these registers into I/O address space in a curious fashion, but one that reflects the unusual register layout within the chip. The COM1 registers (actually the UART registers; each serial port has its own 8250) are mapped into port addresses 3F8–3FEh. COM2 is based at 2F8h. The addresses of all installed COM ports are stored in the RS232_BASE table at 0040:0000 in the BIOS data area.

The range of addresses from 3F8–3FEh comprises only seven registers. One of the 8250 registers, the Scratch Pad Register, is used internally by the UART itself and so isn't assigned an I/O port. The Receiver and Transmitter Registers (used to read and transmit data) share the same port address (3F8h), and two ports divide their loyalty between four internal registers by employing the high bit of another register as an A-B switcher. This bit is called the Data Latch Access Bit, or DLAB for short. If you examine the interrupt 14h source code published in the PC *Technical Reference* manual, you'll see several otherwise cryptic references to DLAB.

The registers and their addresses are as follows:

XF8	Receiver/Transmitter
XF9	Interrupt Enable
XFA	Interrupt Identification
XFB	Line Control
XFC	Modem Control
XFD	Line Status
XFE	Modem Status
XF8*	Divisor Latch LSB
XF9*	Divisor Latch MSB

The asterisks after the last two port addresses indicate that those ports are mapped to the indicated registers when DLAB=1. DLAB is the high bit of the Line Control Register at XFBh and represents a clever gimmick to allow control of ten registers with only three address lines. With DLAB set to zero, XF8 and XF9 point to the Receiver/Transmitter and Interrupt Enable Registers; with DLAB set to 1, they address the Divisor Latch Registers.

When the programmer invokes interrupt 14h to initialize a serial port, the Line Control, Divisor Latch, and Interrupt Enable Registers are reset by the BIOS. Line Control determines the format of the data read and written by the UART, the Divisor Latch Registers determine the baud rate, and Interrupt Enable is used to customize the operation of the UART for interrupt-driven I/O. CARDFILE saves each of these register values before calling interrupt 14h, then restores them after a phone number is dialed, since the program it interrupted might also use the serial port.

If you're intrigued by the concept of the UART and other elements of communications programming, I strongly recommend you get Joe Campbell's new book, *C Programmer's Guide to Serial Communications*. It's the most thorough and comprehensive guide to serial I/O I've ever seen, and it's chock full of information of interest to the programmer and nonprogrammer alike.

—Jeff Prosise

ASSUME change NUMREC in the space occupied by the second CARDFILE would accomplish nothing, since the second copy terminates without becoming resident.

It works because the first time CARDFILE is loaded, DOS points DS and ES to the code segment on entry. But if CARDFILE determines that another copy of itself already resides in memory during its own initialization, it points ES to the code segment of the original program. Then any memory location addressed explicitly by ES refers to an area inside the resident CARDFILE.

MODIFYING CARDFILE A number of CARDFILE's default parameters can be modified in minutes with DEBUG to match your specific hardware or software compatibility requirements. The table "CARDFILE's Modifiable Parameter Addresses" lists the parameters, their addresses, and their default values.

CARDFILE's Modifiable Parameter Addresses

Parameter	Address	Default
Trigger key combination	036Ah	09h
Card capacity (1–255)	0169h	FFh
COM port designator (0–3)	0182h	0h
Modem baud rate specifier	0184h	83h
Modem dial string	0185h	"ATDT"
Modem hangup string	018Ah	"ATH0"

To illustrate the modification process, let's suppose that CARDFILE's normal pop-up key (Alt-Right Shift) conflicts with another resident utility you normally use. You can change the Alt-Right Shift to any combination of the Ctrl, Alt, and Shift keys that's convenient. The following values are assigned to each key:

Right Shift	1
Left Shift	2
Ctrl	4
Alt	8

Add the values that correspond to the trigger keys you want and write the sum to the byte at offset 036Ah. Substituting the value 3, for example, for the default value of 9 would force the window to pop up when both Shift keys are pressed. Following is the script of a DEBUG session that illus-

CARDFILE BY MODEM

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The modem number for PC-IRS is (212) 696-0360. Set your modem and communications software to use 1200 (or 300) bps, 8 data bits, 1 stop bit, no parity. Files with a .COM, .EXE, or .ARC extension require that you also use the Xmodem error-checking protocol; files with .ASM or .BAS extensions can be downloaded using either regular ASCII or Xmodem.

CARDFILE.BAS, whether entered from the magazine at your keyboard or downloaded from PC-IRS, will automatically create CARDFILE.COM when run once in BASIC. CARDFILE.ASM, also listed both here and on PC-IRS, allows you to modify the program but requires you to use a macro assembler (IBM or Microsoft, Version 2 or later) and the following commands:

```
MASM CARDFILE;
LINK CARDFILE;
EXE2BIN CARDFILE CARDFILE.COM
```

Photocopy this page. Trim and hole-punch the copy and add it to your DOS manual.

CARDFILE Command

Jeff Prosise — 1987/No. 17 (Utilities)

Purpose: Combines a database of names, addresses, phone numbers, and memo-IDs with a Hayes-compatible auto-dialer.

Format: `CARDFILE [d:] [filespec]`

Remarks: CARDFILE is normally loaded with a specific database (*filespec*) by being listed as a line in your AUTOEXEC.BAT file. You can switch to another database by repeating the command with a different *filespec* at the DOS prompt. The Alt–Right Shift key combination pops up the CARDFILE window, and Esc returns you to your application. Within the window, the function keys are assigned:

F1–Begin/save a new or edited card
F2–Edit the card currently displayed
F3–Delete the card currently displayed
F4–Search all cards for a text string
F5–Save datafile to disk
F6–Dial the phone number currently displayed

All card data entry and editing is done in overstrike mode. The Backspace key deletes the previous character and the four cursor keys can position the cursor anywhere in the record area. Enter moves the cursor to the start of the next line. You can page through all of the cards with the PgUp, PgDn, and Enter keys. The Home and End keys jump to the first or last card, respectively.

To search the database, press F4 and enter a text string. Pressing Enter resumes the search (which is not case-sensitive) after a match; Esc cancels the search. An alternate way to find a name quickly is to press Alt and a letter key. To find "Smith," for example, hit Alt-S, then use PgDn or Enter to skip past "Sagamore" and "Siddhartha."

When used with Hayes-compatible modems, F6 dials the number currently displayed. At the prompt, pick up the phone and press the Spacebar to break the modem connection. The CARDFILE auto-dialer ignores all nonnumeric characters except the comma, which inserts the pause sometimes needed to access an outside line.

(continues)

CARDFILE Command

Jeff Prosise 1987/No. 17 (Utilities)

Because CARDFILE is a memory-resident program, it must assume rather than change the modem parameters. By default, CARDFILE is initially configured for a 1200-baud modem connected to the COM1. Using DEBUG you can change the value at :0182 from 0 to 1 to change from COM1 to COM2, to 2 for COM3, etc. Similarly, to change to a different baud (bps) rate, change the value at :0184h from the default 83h, as follows:

300 baud	43h
1200 baud	83h
2400 baud	A3h
4800 baud	C3h
9600 baud	E3h

The "ATDT" (dial) and "ATH0" (hangup) strings are at addresses :0185h and :018Ah, respectively. While they can be changed (e.g., substituting a "P", ASCII 80 for the "T" in the dialing command, note that each sequence must be 4 bytes long. The dial string must be delimited by a zero byte, and the hangup string must end with 0Dh and 00.

To save memory, the card capacity may be lowered from the default 255 (FFh) at :0169. Each record takes 192 bytes. And if the Alt–Right Shift "hot key" conflicts with other software, change the default value 09 at address :036A to a combination of the following:

Right Shift	1
Left Shift	2
Ctrl	4
Alt	8

Note: While CARDFILE will operate under DOS 2.*x*, its critical error handler is only fully effective with DOS 3.*x*.

MAKE YOUR CONTRIBUTION

Each issue we publish several assembly language utilities that help you work faster, smarter, or better.

Every Utilities column delivers a compact but useful program that supplements DOS. And PC Lab Notes regularly provides in-depth explanations of particular system-related topics, and includes valuable utilities that demonstrate how things work. These columns unlock the power of your computer by revealing bare-metal programming hints and techniques.

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If you are a serious .ASM programmer and would like to contribute to either the Utilities or PC Lab Notes column, please send us a letter with your name and address, a brief description of your programming abilities, and suggestions for programs you would like to write. A disk containing samples of previous .ASM programming is desirable but not required.

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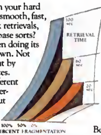

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trates the process of changing the trigger keys to Ctrl-Right Shift:

```
DEBUG CARDFILE.COM
E 036A 5
W
Q
```

Do remember that DEBUG thinks in hexadecimal, however. It's easy to forget that and enter decimal numbers, which DEBUG is happy to accept. But the internal value it assigns the number will be quite different from what you intended.

CARDFILE has a default capacity of 255 (FFh) records. So configured, it commandeers about 50K of memory. If you don't need so many cards, you can set the byte at offset 0169h to the maximum number of records you want. CARDFILE will automatically adjust the amount of RAM it claims at initialization time, setting aside 192 bytes for each record plus about 5K for its own code and data.

CARDFILE is initially set up to operate with a 1200-baud modem connected to the serial port COM1. The byte at 0182h controls which COM port output is directed to. If you use something other than COM1 (older machines supported two serial ports, the newer ones up to four), substitute the port number minus 1 for the value at offset 0182h. Zero represents COM1, 1 represents COM2, and so on.

Changing CARDFILE to support a modem that operates at a baud rate other than 1200 is no more difficult. The byte at offset 0184h contains the 8-bit value CARDFILE uses to initialize the serial port through interrupt 14h, service 0. To reset this byte to any of the commonly used rates, change the byte at address 0184h to one of the values shown below.

300 baud	43h
1200 baud	83h
2400 baud	A3h
4800 baud	C3h
9600 baud	E3h

CARDFILE uses the Hayes-standard "ATDT" string to commence dialing and "ATH0" to force the modem to drop its connection. If your modem uses something else, you can modify the two default strings located at offsets 0185h and 018Ah, respectively. Be warned, however, that neither string may contain more than four characters. The dial string must be delimited by a zero byte, and the hang-up string must end with the hex values 0D and 0. The delimiters are not included in the limit of four characters. If you use pulse dialing rather than tone dialing, substitute the letter P (ASCII 80) for the second T in "ATDT."

Fortunately for the user community, the Hayes command set (and Hayes Smartmodem design in general) has become a de facto standard in the communications world. Even IBM finally admitted as much by introducing its own Hayes-compatible modem. Without such a standard, a program like CARDFILE would be infinitely harder to distribute in working form.

FEATURES YOU CAN ADD If you're an assembly language programmer or aspire to be one, there are a number of features you might want to add to CARDFILE. One likely candidate is an extension of the current editing features to include the Ins, Del, Home, and End keys. Another possibility would be to modify the save routine to compress the data file, thus minimizing the amount of disk space required for storage. A similar change in the file-loading routine would allow the program to unpack the data.

A challenging project for BASIC, Turbo Pascal, or C programmers would be to write a utility to autoconfigure CARDFILE to the desired user specifications. The installation programs that come packaged with most Borland products, such as *SideKick*'s SKINST.COM, are good role models.

If you're interested in TSR development, CARDFILE should serve as an excellent model for your own creations. Just strip out the guts of the MAIN procedure and replace them with your own code, making any necessary adjustments to buffers and named memory locations. Remember that the name of the game in TSR programming is to leave everything just as you found it. If you can accomplish that goal, neither the operating system nor the process you interrupt will ever know you're in town. PC

Jeff Prosise is a contributing editor of PC Magazine.

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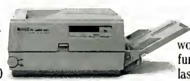

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■ **ENVIRONMENTS** ■ CHARLES PETZOLD

OS/2 AND THE 80286 PROTECTED MODE

Protected mode is incompatible with existing DOS programs and seemingly restricts programmers' use of the PC. What's so good about protected mode?

The Intel 80286 chip in IBM PC ATs and compatibles is the Dr. Jekyll and Mr. Hyde of the microprocessor world. The 80286 can either assume a quiet, uncomplicated "real-mode" personality compatible with the earlier 8086 and 8088 microprocessors, or it can be switched into what Intel calls the "protected virtual address mode." At first encounter, the unfamiliarity and strangeness of protected mode makes it seem as scary as Mr. Hyde. And because Microsoft's new Operating System/2 uses the 80286 in protected mode, some people are leery about OS/2 itself.

The worst problem is that existing MS-DOS programs cannot run in protected mode. For this reason, OS/2 includes a "DOS Compatibility Box" that runs existing programs in real mode. The advantages of protected mode—the 16-megabyte memory space and the multitasking support—are of benefit only to new programs specifically designed for OS/2.

So some people are asking: Is it worth it? What makes protected mode so great? Why should I give up DOS for something that offers no benefits for existing DOS programs? Why should I care about breaking the 640K barrier when expanded memory already gives me access to big megabytes? And who needs multitasking? And even if I do need multitasking, what's wrong with *DESQview* or *Windows*?

We can start answering these questions by examining the protected-mode and real-mode environments of the 80286 and by looking at some of the ways in which OS/2 uses protected mode. Basically, protected-mode operation of the 80286 offers hardware support of many features that are critical to the operation of a serious operating system.

MORE THAN MEGABYTES The 1-megabyte memory addressing limit of the 8086 family microprocessors (and of the 80286 when running in real mode) is based on the way the 8086 calculates memory addresses. Each memory address requires both a 16-bit segment address and a 16-bit offset address. The segment address is shifted 4 bits to the left and added to the offset address, resulting in a 20-bit physical address that spans a megabyte.

In protected mode, the calculation of a physical memory address is not as straightforward. An operating system (such as OS/2) that runs in protected mode must maintain several tables in memory, called "Descriptor Tables." Each process currently running under the operating system has its own Local Descriptor Table (LDT) and all the processes share a Global Descriptor Table (GDT).

> ■ Basically, protected-mode operation of the 80286 offers hardware support of many features that are critical for a serious operating system.

Each Descriptor Table contains a series of 8-byte Segment Descriptors. Each Segment Descriptor describes a memory segment that can range in size from 1 byte to 64K bytes. A Segment Descriptor contains the following information:

- ■ A 16-bit Limit (the segment size).
- ■ A 24-bit Base Address (the physical address of the start of the segment).
- ■ An Access Rights byte.
- ■ Two bytes of zeros (reserved for use by the 80386).

In real mode, a segment address references an actual physical memory address; in protected mode it does not. In protected mode, the segment address is a "virtual address" that doesn't directly address physical memory. The segment address is often called a "selector" because it references (or selects) one of the Segment Descriptors in the GDT or LDT. This Segment Descriptor then provides the 80286 with the physical Base Address. Because the Base Address in the Segment Descriptor is 24 bits wide, the physical memory space of the 80286 is 16 megabytes.

If that were all the 80286 could do in protected mode, it wouldn't be much of an improvement over real mode. However, these Segment Descriptors provide important benefits to an operating system and the programs that run under it.

MEMORY MANAGEMENT In a multitasking operating system, various programs can be started up and terminated throughout a session. Each program may require several memory segments. When a program terminates, these segments are freed for use by other programs. Normally, this would lead to memory fragmentation. It would be necessary for an operating system to shift the existing memory segments around in memory to consolidate the free space.

In real mode, this is impossible. Applications programs use segment addresses to access their code and data segments in memory. If the operating system moved these segments, then the segment addresses would no longer be valid.

In protected mode, however, this job becomes relatively easy and transparent to applications programs. The segment addresses that an applications program may be holding are not physical addresses. They are virtual addresses that indirectly reference physical memory through the Descriptor Table. The operating system can thus move a segment in memory and then change the Base Address of the Segment Descriptor. The program holding the selector that references the segment is not aware that this has happened. It continues to address the same memory but the memory is now at a new location.

This type of memory management is absolutely essential to a multitasking operating system, and it cannot be done in real mode without a great deal of trouble. (The real-mode DOS version of *Microsoft Windows* is able to move an application's code and data segments in memory, but it does so only with a great deal of cooperation from the program itself.)

This is also one of the primary reasons why existing programs cannot run in protected mode. Many programs treat segment addresses as if they referenced physical memory—even performing arithmetic on them. This arithmetic doesn't work in protected mode.

MEMORY PROTECTION Under a multitasking operating system, system crashes have the potential of being much worse than in a single-tasking system such as MS-DOS. The worst that could happen under MS-DOS is that you could lose the work you had done in a program since the last save. In a multitasking operating system, you could lose work from several different programs that may all be running at the same time.

Many program bugs (particularly in the more freewheeling languages such as C and assembler) are the result of code that writes on an area of memory that it shouldn't be writing on. Under real mode, there's nothing an operating system can do to prevent this from happening.

> ■ In protected mode the segment addresses that an applications program may be holding are not physical addresses.

Under protected mode, there is. As the name implies, protected mode protects the operating system and other programs from events that would otherwise result in a system crash or a loss of system integrity. The 80286 chip can detect when a program is about to access memory that doesn't belong to it. This causes a "protection exception," at which point the 80286 microprocessor generates an interrupt that turns control over to the operating system. The operating system can then terminate the offending program and recover gracefully without a crash.

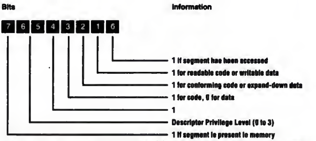
Memory protection is the result of several checks the 80286 performs when a program uses memory either in executing code or in accessing data.

First, a particular process can only execute code or access data in segments described in the Global Descriptor Table or (more often) the process's own Local Descriptor Table. Because each process has its own Local Descriptor Table, this effectively isolates a program from possibly destructive actions taken by another program.

Second, the Segment Descriptor contains a 16-bit limit that defines the size of the segment. If a program attempts to execute code or access data beyond the end of the segment, the 80286 generates a type of protection exception called a "segment overrun."

Third, each Segment Descriptor has an Access Rights byte, containing 8 bits as shown in the diagram "The Access Rights Byte." Each memory segment has a Descriptor Privilege Level (DPL), which can range from 0 (the highest privilege, reserved for kernel functions within the operating system) to 3 (the lowest privilege, for most applications programs). Each process has a Current Privilege Level (CPL) that is the DPL of its currently executing code segment. A program cannot execute code or access memory when the DPL is numerically lower than its CPL. This scheme protects the operating system itself from possibly destructive programs. (Thus, for example, the Global and Local Descriptor Tables themselves can only be changed by the operating system and not

The Access Rights Byte


Bits
Information
7
6
5
4
3
2
1
6
1 if segment has been accessed
1 for readable code or writable data
1 for conforming code or expand-down data
1 for code, 0 for data
1
Descriptor Privilege Level (0 to 3)
1 if segment is present in memory

This element in the Segment Descriptor contains information that the 80286 uses to protect memory and prevent system crashes.

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Bit 3 of the Access Byte identifies a segment as code or data. When operating in protected mode, the 80286 microprocessor will not allow a code segment to be written upon. This prevents a program from chewing up its own code.

In theory, then, an operating system such as OS/2 that uses protected mode can be virtually crashproof. I say "in theory" because: (1) the 80286 chip is not perfect; (2) OS/2 is not perfect; and (3) OS/2 also has to run in real mode to support existing DOS programs. This last item is the most dangerous. If a real-mode program crashes, there's not much OS/2 can do to recover because all this memory protection is disabled in real mode.

IMPLEMENTING VIRTUAL MEMORY The Access Rights byte also has a few other tricks up its bits. Bit 0 is called the Accessed bit and Bit 7 is called the Present bit. These two bits assist the operating system in implementing virtual memory.

The 80286 automatically sets the Accessed bit of a Segment Descriptor to 1 when a program loads a selector into a segment register. A protected mode operating system such as OS/2 can periodically sweep through all the Segment Descriptors, check which segments have their Accessed bits on, and turn them all off. Analysis of the Accessed bits allows the operating system to determine which segments have been least recently used.

If a segment has not been accessed for some time and it becomes necessary to generate some free memory space, OS/2 will write that segment out to a disk file and then reset the Present bit to 0. This means that the segment is no longer present in memory. But the Segment Descriptor still exists and the segment selector is still valid.

When a program loads a segment selector into a segment register with an instruction such as

```
MOV ES, [DATA_SEGMENT]
```

or calls a routine in another segment,

```
CALL FAR_ROUTINE
```

the 80286 will check the status of the Present bit. If it is 0, then the chip generates an interrupt 0Bh. This calls a routine in the operating system which can then load the segment into memory and perhaps swap out another segment in the process. The operating system then returns to the interrupted instruction and the program proceeds normally, in most cases entirely unaware that the instruction resulted in some disk swapping.

> ■ The memory requirements of OS/2 are actually *smaller* than DOS when you take into account the total amount of memory the operating system can manage.

While OS/2 swaps data segments by writing them out to disk and later reading them back in, it can use a short cut for code segments. For code segments, OS/2 can simply free up the memory space occupied by the code segment without saving the code segment to memory. OS/2 can then later reload the code segment from the program's original .EXE file.

OS/2 allows programmers to take advantage of the "demand loading" of code segments by creating multisegment programs with various segments marked as "load on call." These segments will not be loaded into memory until the program needs to use them.

SHARING CODE AND DATA As we've seen, code segments cannot be altered once they are loaded into memory. Programmers can also mark certain data segments in a program as read-only, which means that these segments cannot be altered. OS/2 will set up the Segment Descriptors to denote this and the 80286 will enforce the protection of the memory.

This allows OS/2 to do some other memory conservation. The code segments and read-only data segments can be shared when multiple copies of a program (often called multiple "instances") are run concurrently.

Suppose, for example, that you're running an OS/2 spreadsheet program that has 250K worth of code. You decide to run another instance of the program. The second instance won't eat up another 250K because it can use the same code segments as the first copy. If this spreadsheet program had a large read-only data segment containing (for instance) "help" text, then multiple instances of the program could share this segment also.

An operating system could not allow multiple instances to share code and data with any assurance if it did not have the hardware support of the 80286 microprocessor. Under real mode, a programmer could inadvertently flag a data segment as read-only but then write on it. In real mode, this would go undetected. In protected mode, the 80286 enforces the programmer's intentions.

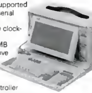
STRETCHING MEMORY Over the years, as the memory in our PCs has grown from 64K to 256K to 640K, we have come to realize that no amount of memory is ever enough. Part of the anxiety over OS/2 involves the memory it requires.

Without a doubt, OS/2 is big. In the beta-test version supplied with the OS/2 Software Development Kit (which reportedly still has some debugging code built into it), OS/2 requires about half a megabyte of memory. In contrast, the most recent version of DOS uses about 80K.

The difference in size parallels the difference in functionality. DOS is single-tasking, does no memory management to speak of, and supports interprocess communication only through the use of primitive file-based pipes. OS/2 is more akin to operating systems that are common on minicomputers and mainframes.

The memory requirements of OS/2 are actually *smaller* than DOS when you take into account the total amount of memory the operating system can manage. OS/2 is about 1/32 of the total amount of physical memory—16 megabytes—it can handle, while the latest version of DOS takes up about 1/8 of its 640K limit under real mode.

Moreover, we've seen various ways



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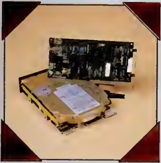

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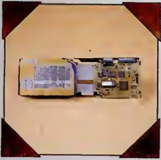

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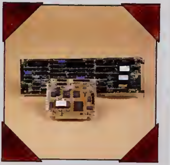

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that the memory management features of OS/2—assisted in large part by the protected mode of the 80286—go a long way in stretching the capacity of the 16-megabyte limit. Virtual memory in particular prevents OS/2 from being limited by the amount of memory installed in the machine. The amount of memory that is available to OS/2 applications is really based on the amount of physical free memory plus the amount of free disk space.

THE MULTITASKING SUPPORT We have also seen various ways in which 80286 memory protection assists the operating system in isolating the various programs running under it. When running in protected mode, the 80286 also includes direct hardware support of switching between these programs.

Each process running under OS/2 has its own Local Descriptor Table. This is referenced by an entry in a special segment called a "Task State Segment" that is used to save the CPU state when the operating system switches between tasks. Once the operating system sets up all these tables in memory, it can switch between the various tasks through a single instruction that takes about 22 microseconds.

Of course, the implementation of multitasking is much more involved than just doing the task switches. The operating system must include several other features that allow multiple programs to run without interfering with each other. For example, OS/2 incorporates network-type file sharing. A program that opens a file can prevent other programs from reading the file or writing to the file while it is open. Open files are protected against deletion, renaming, or moving to another subdirectory. OS/2 also includes "semaphores" that allow various processes to synchronize operation. This is particularly important in a program that creates one or more "threads" of execution in which different parts of the program essentially run simultaneously.

Sharing of system resources (such as the screen and the keyboard) is also a necessary part of multitasking support. Most large DOS applications directly access the computer's hardware—particularly the video display. In the process they make themselves immune from multitasking. (This is another reason why OS/2 can't multitask existing DOS programs.) In contrast, OS/2 programs have at their disposal a complete set of very fast character-mode video I/O functions that completely eliminate the need to write directly to the screen in character mode. Because all video I/O goes through the operating system, OS/2 can successfully save the video state of one program, allow that program to continue to run while another program is using the display, and then restore the video state of the first program.

GETTING SERIOUS Protected mode is a hostile environment for existing DOS programs because it sets certain rules that the programs do not have to abide by—and often haven't—in real mode. It is not surprising that some people view protected mode as the evil Mr. Hyde personality of the 80286 chip.

■ OS/2 programs have a complete set of very fast character-mode video I/O functions that eliminate the need to write directly to the screen.

But to my mind, the real Mr. Hyde of the 80286 is its real mode. Real mode has limited DOS to an environment that requires a lot of greasy-kid-stuff add-ons (expanded memory, RAM-resident pop-ups, *DESQview*) to make it satisfactory to users. None of these add-ons work very well because the operating system is suffering under a mode of the 80286 that offers no hardware support of multitasking and large memory, and no operational integrity. Protected mode gives the operating system a fighting chance and liberates programs from the anarchic environment of real mode. PC

Charles Petzold is a contributing editor of PC Magazine.

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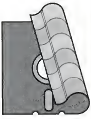

Combining bar charts for projections; searching for quotes in SuperCalc; where to put your 1-2-3 macros; turning directory entries into usable filenames; watching out for spaces.

LISTINGS INTO FILENAMES

A common way to manipulate *1-2-3* files on disk is to redirect the screen output from a directory command to a disk file. Entered at the DOS prompt, a command such as

```
dir *.wk? > files.prn
```

creates a disk file called FILES.PRN that contains all *1-2-3* files. You can then use /File Import Text to get this directory into a *1-2-3* worksheet, where you can sort or annotate it.

However, even if you use the *1-2-3* Data Parse command to separate filenames from file size, date, time, etc., there are some things you still can't do with the filename. The macro in Figure 1 demonstrates a technique that converts a line from a file directory into a loadable filename.

An imported directory listing is a column of entries like the one in the last line of the figure. They are long labels. If you put the cursor on one and run the macro with Alt-G, it will load the file of that name.

The macro works by copying the long label to the range named LONG, where the eight leftmost characters are extracted in a cell named SHORT (which contains the formula to its right). Eight characters have to be extracted because filenames can be that long. However, if the name is less than eight characters long, the display in the cell named SHORT will be treated by the load command as having trailing spaces. This is why the macro can't simply put the contents of SHORT into the cell named SPACE and use it as a filename. The trailing spaces make it an illegal filename. The macro transfers SHORT to SPACE, but with a format equal to the actual length of the name. (The number returned by the @find function adds this parameter to the {contents} command.) The /File Retrieve sequence then acts on the contents of SPACE, and the closing tilde completes the command.

```
\G             /c~LONG~{contents SPACE,SHORT,@find(@char(32),LONO,1)}/fr
SPACE          REALTY
               ~


SHORT          REALTY                <=== @left(LONO,8)

LONO           REALTY   WK1          8731   9-12-85   1:23a
```

Figure 1: *A macro that converts a directory entry into a readable filename.*

Dan Will
Huntington Beach, California

Mr. Will submitted this routine as part of a batch file and macro combination that imports a directory and then lets you load the file of your choice. 1-2-3 *already lets you do that with the /File Retrieve Name (F3) command. However, the clever conversion with the {contents} command has broader applications.*

SPACED-OUT MACROS

While writing a *1-2-3* macro I recently ran across a problem that I hope I can help others avoid. The macro contained a goto that should have taken the cursor to another location, but it wouldn't work. I kept getting a beep, and the range name of the location I was trying to reach would appear in the current worksheet cell. Running STEP shed no light on the problem, and *1-2-3* was not giving me an error message. After much frustration I discovered the problem: I had unintentionally put in a trailing space at the end of a command. The space served to "initialize" the current cell to receive a label, and when the macro next encountered a label (in this case, the range name of my destination cell), it entered it.

We all know enough to avoid leading spaces in macros. I can't speak for all the macro commands, but as a rule it makes sense to avoid trailing spaces. And if you get an error that you can't understand, that may be the cause.

Thomas Burnakis
Wyandotte, Michigan

This is an uncommon but nasty problem because you can study a macro script all you want and not find trailing spaces. The only way to find them is to actually Edit macro cells. However, as Mr. Burnakis implies, not all commands will be sabotaged by trailing spaces. Branching commands take effect immediately, and the macro processor ignores trailing characters of any kind. You can fill the row with garbage and 1-2-3 *won't care.*

Leading spaces are a different and interesting problem. Some macro com-

```
\Z      {GETTEXT "Praaa a printabla kay, than RETURN.",Al}    Gat a key.' (GETTEXT alao inaarta a quote mark.)
        {HOME}                                               Mova curaor to homa.
        {EDIT}}{HOME}{INSERTON}{"                            Try to maka it a taxtual valua.
        {IF Al=QUOTE}{BRANCH YES}                            If it now equala ("") tha original contanta wara "".
        {INHERTOFF}{EDIT}{BS}{HOME}{DEL 2}~                  Raatora tha call to it'a original contanta.
        {MESSAGE "Laat key presaed waa NOT a quota.")        Output maaaaga.
        {BRANCH \Z}                                          Enable diaplay and start over.


YES     {INSERTOFF}{EDIT}{BS}{HOME}{DEL}~                    Reatora tha cell to it'a original contanta.
        {MESSAGE "Laat key praased waa a quota."}            Output maaaaga.
        {BRANCH \Z}                                          Enabla diaplay and atart ovar.

QUOTE                                                        Thia cell containa ("") which ia a taxtual valua
                                                                  and not viaibla.
```

Figure 2: *A* SuperCalc *macro that tests cells for the quote mark.*

mands work fine in spite of them; others only appear *to work properly. The very short macro shown below demonstrates this.*

```
\A              {branch NEXT}

NEXT      {down 2}
```

The first line of the macro begins with several spaces, but if you run the macro you will find that it works. However, if you put the cursor on a cell that contains data and then run the macro, you will lose your data. That's because the leading spaces in the first line of the macro are still waiting to be acted on, and moving the cursor down into the second line of the macro enters them.

If, on the other hand, you add trailing spaces or any other characters after *the {branch} command in the first line of the macro,* 1-2-3 *will ignore them.*

UNHAPPY RETURNS

The {for} macro command in *1-2-3* is very helpful for running subroutines a specific number of times. However, if the subroutine ever involves adding or deleting rows or columns, the macro processor won't return to the right address to continue carrying out the {for} command. In other words, if the subroutine adds a row above the macro, the macro processor will return to a point one cell above the one with the {for} command. If the subroutine adds two rows, the macro processor will return to a point two cells above, etc.

Depending on what is in the cell to which the macro processor returns, you'll either get an error message or the macro will continue incorrectly. In either case, it's a troublesome problem to have to fix. It will save you much time and effort if you know about this quirk in *1-2-3*'s macro language and avoid the problem to begin with.

R. Vandenbergh
Kortessem, Belgium

This annoyance has been around since the days of Release 1A. The /XC command runs into the same problem if the routine it calls adds or deletes rows or columns. Watch out for the same thing when you use {return} to end a subroutine.

There are, of course, times when you can add all the columns and rows you like without affecting the way the macro behaves. So long as the new columns are to the right of the macro and the rows are below it, the macro processor will return from its routine exactly as it's supposed to.

Many people keep their macros to the right and below their worksheet while they are building the model. This way, as they add or remove rows and columns they won't affect macros. However, if you must manipulate rows and columns from within a macro subroutine, you'd better park your macros above and to the left.

DETERMINING CONTENTS

While writing a database application for *SuperCalc 4*, I had to find a way to tell if a cell contained a quote mark (") and nothing else. Since *SuperCalc* has no string functions and the quote is used as a delimiter, there was no obvious way to do it.

The macro in Figure 2 does the job by converting the cell to a textual value with Edit and then comparing it with a known textual value of (""). The test value contains two quote marks since the GETTEXT function in the macro inserts a leading quote. When you run the macro, be sure to give the range names in the cells in the rightmost column to the cells to their right.

On an entirely different subject, I have found that a cell can turn out differently depending on whether it's formatted as an entry or as a column. For example, if you left-justify a whole blank column with the command /FC,LA the cells in the column will stay blank, as you would expect. But if you left-justify blank cells with /FE,LA they will get a text attribute.

This doesn't normally matter, because as soon as you enter a number, it will be justified appropriately. It makes a difference only if you test such a cell with ISBLANK. Where you would expect a value of one (true), you get a value of zero (false). You can avoid this problem by formatting by row or column rather than by entry.

■ Many people keep their macros to the right and below their worksheet. If you must manipulate rows and columns from within a macro, park them above and to the left.

Donnie Carville
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Jeffrey Bowen
Hendersonville, North Carolina

```
     Original Data                                  New Arrangement

  X Range    A Range                           X Range  A Range    B Range

   1981        11    Actual                      1981        11          0
   1982        12                                1982        12          0
   1983      12.5                                1983      12.5          0
   1984      13.2                                1984      13.2          0
   1985      14.2                                1985      14.2          0
   1986      14.7                                1986      14.7          0
   1987      15.3    Projected                   1987         0       15.3
   1988      15.7                                1988         0       16.7
   1989      16.9                                1989         0       16.9
   1990      17.9                                1990         0       17.9
```

Figure 3: *Graph settings that use color to distinguish actual data from projections.*

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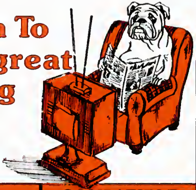

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CIRCLE 481 ON READER SERVICE CARD

■ PAUL SOMERSON

USER-TO-USER

Two ways to underline text on EGA-compatible monitors, and an automatic technique for using a DOS quirk to access the system date from within a batch file.

EGA UNDERLINES

One of the minor annoyances of using a program like *WordPerfect* with an EGA is that underlined characters are displayed on the screen in a color of your choice rather than as characters with a line under them. This forces you to remember which colors are installed as underlined, boldface, and underlined-boldface, and turns many popular programs into somewhat less than "What-You-See-Is-What-You-Get."

Using several of the techniques from Charles Petzold's article, "Exploring the EGA, Part 2" (*PC Magazine*, Volume 5 Number 15), I developed the program UNDERLN.COM, created by the UNDERLN.SCR DEBUG script in Figure 1, for systems with an IBM (or compatible) Enhanced Graphics Adapter. UNDERLN will generate an underlined character font from the EGA BIOS resident 8 by 14 font and load it as the EGA low-intensity characters. Only the "printable" characters with ASCII values from 32 through 127 will be underlined.

Typing UNDERLN ON from the DOS prompt (or in a batch file) causes any low-intensity characters on the screen to be underlined, and any high-intensity characters will not be underlined. Or, if you prefer,

```
N UNDERLN.COM
A 100
CLD
PUSH  DS
PUSH  ES
MOV   AL,[005D]       ; get first character of parameter
CMP   AL,4F           ; is it 'O'?
JZ    0118            ; yes, jmp 2ndChar
CMP   AL,6F           ; is it 'o'?
JZ    0118            ; yes, jmp 2ndChar
MOV   DX,0194         ; BADPARM
MOV   AX,0900         ; print message
INT   21
INT   20              ; exit
MOV   AL,[005E]       ; 2ndChar
CMP   AL,4E           ; is it 'N'?
JZ    013A            ; yes, jmp TURNON
CMP   AL,6E           ; is it 'n'?
JZ    013A            ; yes, jmp TURNON
CMP   AL,46           ; is it 'F'?
JZ    012D            ; yes, jmp 3rdChar
CMP   AL,66           ; is it 'f'?
JZ    012D            ; yes, jmp 3rdChar
JMP   010E            ; no, jmp BADPARAM
MOV   AL,[005F]       ; 3rdChar
CMP   AL,46           ; is it 'F'?
JZ    013D            ; yes, jmp TURNOFF
CMP   AL,66           ; is it 'f'?
JZ    013D            ; yes, jmp TURNOFF
JMP   010E            ; no, jmp BADPARAM
STC                   ; TURNON -- set carry flag
JMP   013E            ; jmp FontPointer
CLC                   ; TURNOFF
MOV   BH,02           ; FontPointer -- get 8x14 font
MOV   AX,1130
INT   10              ; returns ES:BP
PUSH  ES
POP   DS
MOV   SI,BP           ; DS:SI points to font
PUSH  CS
POP   ES
MOV   DI,0194         ; ES:DI = destination
MOV   CX,00E0         ; 32 control chars @ 7 word/char = 224 words
LODSW                 ; NEXTWORD1 -- get 2 bytes
STOSW                 ; store them, unmodified (not underlined)
LOOP  01B1            ; loop NEXTWORD1
MOV   CX,0060         ; 96 "printable" characters
PUSH  CX              ; NEXTCHAR -- save character counter
MOV   CX,000B         ; get and store 1st 12 bytes of character
LODSW                 ; NEXTWORD2 -- get 2 bytes
STOSW                 ; store them
LOOP  015C            ; loop NEXTWORD2
LODSW                 ; get last 2 bytes
JNB   016B            ; underlining on? no, jmp STORELASTWORD
MOV   AH,FF           ; yes, underline the character
STOSW                 ; STORELASTWORD -- store last 2 bytes
POP   CX              ; restore character counter
LOOP  0168            ; loop NEXTCHAR
MOV   CX,0380         ; 128 "foreign" chars = 896 words
LODSW                 ; NEXTWORD3 -- get 2 bytes
STOSW                 ; store them
LOOP  01BC            ; loop NEXTWORD3
MOV   BP,0194         ; point to new font
MOV   CX,0100         ; character count
XOR   DX,DX           ; starting character
MOV   BX,0E01         ; BH = bytes/char -- BL = block to load
MOV   AX,1100         ; load font
INT   10
MOV   BX,0001         ; MOV  BX,0004: HIGH INTENSITY UNDERLINE
MOV   AX,1103         ; set block spec
INT   10
MOV   BX,0712         ; enable only low planes
MOV   AX,1000         ; enable planes
INT   10
POP   ES
POP   DS
INT   20
DB 0A 0D 'Type: UNDERLN ON to load the underline font'
DB 0A 0D '      UNDERLN OFF to unload the underline font'
DB 0A 0D '$'

R CX
F4
W
Q
```

Figure 1: *UNDERLN.SCR script to create UNDERLN.COM. This will underline all low-intensity characters on EGAs. Use a pure-ASCII word processor or the DOS COPY CON command to create it (omit the semicolons and the text following the semicolons). Then put this file on the same disk as DEBUG.COM (2.0 or later) and type DEBUG < UNDERLN.SCR*

■ USER-TO-USER

```
N UNDERLN2.COM
A 100
MOV AL,[005D]   ; 1st char of argument, if any
XOR BX,BX
MOV DS,BX
MOV AH,[0485]   ; AH = bytes/char
CMP AL,4E       ; 'N'
JZ  0111        ; don't underline
DEC AH          ; underline at last scanline
MOV DX,[0463]   ; DX = port address, video ctrlr
MOV AL,14       ; AL = Underline Loc data register
OUT DX,AX
INT 20

RCX
1A
W
Q
```

Figure 2: *Script to create UNDERLN2.COM that will underline blue-on-black text on EGA monitors. Run this with the sample EGAUNDER.COM program on an EGA to see underlined text.*

changing the line in Figure 1

```
         INT 10                 INT 10
from     MOV BX,0001     to     MOV BX,0004
         MOV AX,1103            MOV AX,1103
```

will underline the high-intensity characters and use the normal EGA 8 by 14 font with the low-intensity characters.

Typing UNDERLN OFF restores the normal font. Resetting the display mode will also eliminate the underlined characters. The command line parameters, ON and OFF, are not case sensitive.

Since *WordPerfect* does not reset the video display mode upon entry into the program, the following batch file will turn on underlining while running *WordPerfect* and turn it off upon exiting.

```
UNDERLN ON
WP
UNDERLN OFF
```

Once in *WordPerfect* you may define the screen colors using the Ctrl-F3, 4 key. Pick foreground and bold colors from the high intensity colors, I (dark gray) to P (white); and underline and bold underline colors from the low intensity colors, A (black) to H (gray). I use background A (black), foreground L (bright cyan), underline D (cyan), bold M (bright red), bold underline F (magenta).

Peter N. Howells
Reno, Nevada

This patch makes WordPerfect *magical on EGAs; no one likes to look at one color for bold, another for underlined, and so on. But you can adapt the program to underline the output of any other application that doesn't completely take over the hardware and that lets you give underlined text its own attribute. Note: this program may produce snow on some EGA Monitors.*

A more modest EGA underline program was submitted by Brian O'Neill, of Boston, Massachusetts, whose UNDERLN2.COM utility (created by the UNDERLN2.SCR script in Figure 2) will underline any text with a blue-on-black attribute. You can create this program by redirecting the script into DEBUG:

```
DEBUG < UNDERLN2.SCR
```

Type UNDERLN2 N or UNDERLN2 n to turn underlining off; type just UN-

■ The only attributes that UNDERLN2 underlines are 1 and 9 (both normal and high-intensity).

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```
N EGAUNDER.COM
A
MOV AX,0600
MOV BH,02
MOV CX,0000
MOV DX,1950
INT 10
MOV AH,02
MOV BH,00
MOV DX,0000
INT 10
MOV AX,0950
MOV BX,0001
MOV CX,0028
INT 10
MOV AH,02
MOV DX,0028
INT 10
MOV AX,0943
MOV BL,02
INT 10
INT 20

RCX
31
W
Q
```

Figure 3: *Script to create EGAUNDER.COM program that displays text in attribute 01 (blue on black) and 02 (green on block). Run this with UNDERLN2.COM on an EGA to underline the blue text.*

DERLN2 in order to toggle it on.

As Mr. O'Neill explains, the EGA can display fonts with more or fewer than 25 lines on-screen, so the number of scanlines per character is not fixed at 14. The scanline that displays the underline depends upon the number of "bytes per character" in the currently displayed font. UNDERLN2.COM fetches this information from 0040:0085H of the BIOS data area.

The program also looks up the port address of the video controller; this address will vary, depending upon whether the EGA card is being used with a color or a monochrome monitor. UNDERLN2.COM will work in either case.

The only attributes that UNDERLN2 will underline are 1 and 9 (blue on black, both normal and high-intensity). However, Charles Petzold's EGACOLOR.COM can be used to change colors 0, 1, and 9 to whatever colors you want. You can see the program in action by using the EGAUNDER.SCR script to create the sample EGAUNDER.COM program in Figure 3 with the command

```
DEBUG < EGAUNDER.SCR
```

EGAUNDER.COM will display a string of 40 Ps in blue and 40 Cs in green. Then use UNDERLN2 and UNDERLN2 N to toggle the blue text underlining on and off.

CURRENT EVENTS

It's well known that DOS can't get access to the date or time when running batch files. I recently ran across a trick from Dana Snow that gets around this problem. My implementation of it requires two batch files besides your AUTOEXEC.BAT. One is made by the others. The other one, which you create, must be called CURRENT.BAT.

Let's assume you want to run a program called ONCEONLY.COM only once a day. Add the following to your AUTOEXEC.BAT:

```
ECHO ¦ MORE ¦ DATE >> READDATE.BAT
```

and make

```
READDATE
```

the last line in your AUTOEXEC.BAT. Then create a batch file called CURRENT .BAT:

```
ECHO OFF
IF !%TODAY%==!%4 GOTO END
SET TODAY=%4
ONCEONLY
:END
```

You can even arrange that it only runs once a week, say every Friday, by adding a line:

```
IF NOT %3==Fri GOTO END
```

after the line SET TODAY=%4. And as a bonus, you wind up with today's date in the environment.

This works by creating a file READDATE.BAT, containing the output of DATE:

```
Current date is Wed 9-30-1987
Enter new date (mm-dd-yy):
```

DOS tries to run the line beginning with "Current date is" by looking for an executable file (.COM, .EXE, or .BAT) called CURRENT—and finds the one we created called CURRENT.BAT. DOS then interprets the groups of words and numbers following the word "Current" as parameters for CURRENT.BAT. So it reads "date" as %1, "is" as %2, the day of the week as %3, and the actual numerical date as %4.

Barry Simon
Pasadena, California

Be sure your environment is large enough to hold the %TODAY% variable (see PC Lab Notes, Volume 6 Number 7).

One special trick that's worth noting is the use of the MORE command in the middle of the ECHO ¦ MORE ¦ DATE > READDATE.BAT line. All this does is supply the extra carriage return that the DATE command needs to execute properly. (To make this work, MORE.COM has to be in the same directory or in one that your PATH knows about.) Note also that adding READDATE as the final line in your AUTOEXEC.BAT means that as soon as AUTOEXEC.BAT finishes, DOS will load and execute the READDATE .BAT file.

J. Fletcher, of Gainesville, Florida, who didn't have an internal clock but needed to reboot frequently, suggested an almost identical process. His technique, adapted here, included these lines near the top of his AUTOEXEC.BAT file:

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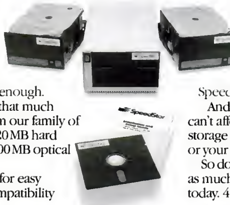

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CIRCLE 476 ON READER SERVICE CARD

```
ECHO OFF
IF NOT EXIST D.BAT GOTO SETIT
COMMAND /C D
GOTO CONTINUE
:SETIT
DATE
COMMAND /C DATEMAKE
:CONTINUE
```

The COMMAND /C allows one batch file to run another batch file and then jump execution back to the first when the second is done. Users of DOS 3.3 could substitute CALL for COMMAND /C. D.BAT is a short batch file created by DATEMAKE .BAT, containing the lines

■ COMMAND /C allows one batch file to run another batch file and then jump back to the first when the second is done.

Current date is Wed 9-30-1987
Enter new date (mm-dd-yy):

(or whatever the last set date was).

The DATE command below COMMAND /C D conveniently lets you correct the date the first time you run AUTOEXEC.BAT each day.

DATEMAKE.BAT contains one line

```
ECHO | MORE | DATE > D.BAT
```

Again, MORE.COM has to be in the current subdirectory or in one your PATH knows about. The only other file you need for this to work is a tiny one called, you guessed it, CURRENT.BAT:

```
DATE %4
```

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CIRCLE 538 ON READER SERVICE CARD

■ **EDITED BY CRAIG L. STARK**

POWER USER

Using Clipper's interactive GETs for running totals; creating WordPerfect indexes by record rather than by page; getting absolute number values in dBASE; showing page breaks in WP.

SPACED OUT

Many word processors properly insert two blank spaces at the end of sentences. Curiously, this is one function that *WordPerfect* does not have. The macro below takes any length of text and ensures there are two blank spaces following punctuation such as periods (.), question marks (?), exclamation points (!), and colons (:), but only when they occur with a trailing blank space. It checks for words such as Dr., Mrs., Ms., or Mr. and does not insert double blanks after these abbreviations.

The keystrokes required to create the macro are shown below, with each space indicated by a # character.

```
SPACES.MAC
<Home><Home><Up><Alt-F2>N.#<Esc>.##<Esc>
<Home><Home><Up><Alt-F2>N.###<Esc>.##<Esc>
<Home><Home><Up><Alt-F2>N?#<Esc>?##<Esc>
<Home><Home><Up><Alt-F2>N?###<Esc>?##<Esc>
<Home><Home><Up><Alt-F2>N!#<Esc>!##<Esc>
<Home><Home><Up><Alt-F2>N!###<Esc>!##<Esc>
<Home><Home><Up><Alt-F2>N:#<Esc>:##<Esc>
<Home><Home><Up><Alt-F2>N:###<Esc>:##<Esc>
<Home><Home><Up><Alt-F2>NMr.##<Esc>Mr.#<Esc>
<Home><Home><Up><Alt-F2>NMrs.##<Esc>Mrs.#<Esc>
<Home><Home><Up><Alt-F2>NMs.##<Esc>Ms.#<Esc>
<Home><Home><Up><Alt-F2>NDr.##<Esc>Dr.#<Esc>
<Home><Home><Up>
```

The macro first goes to the top of the file and changes all occurrences of period-space to period-space-space. It then changes all period-space-space-space back to period-space-space. This is repeated for the question mark, exclamation point, and colon. Finally it checks for abbreviations such as Mr. or Mrs. and removes the space-space that follows. Any number of common abbreviations can be accommodated in this way (e.g., No., approx., e.g., etc.).

Dr. Ken Lee
Madison, Wisconsin

Here's a timesaving tip: create Dr. Lee's macro in an empty document, so you won't have to wait for all of the Search/Replace events. And if you use it on a long document, wait until the final draft to apply it. —Neil J. Rubenking

ROOTING OUT THE ABSOLUTE

In *dBASE* programming it's sometimes very useful to obtain the absolute value of a number. Although *dBASE III Plus* contains the ABS() function, users of previous versions are not so lucky.

One obvious solution is to use

```
IF numvar<0
  numvar=-numvar
ENDIF
```

You can't use this approach, however, in a Report Form or a SUM command where you must have a single expression, not three lines of code. To squeeze the ABS() value from one line of code, try

```
SQRT(numvar^2)
```

Because the square of any number is positive, its square root is too. Simple.

Alfonso Balzowski
Concord, California

■ A remarkable *Clipper* capability makes individual GET statements interactive, so your screen could show a running total from a single READ.

This works beautifully, but you must be careful if your numbers are large. By simple experimentation I found that, with the default SET DECImals TO 2, Mr. Balzowski's method was accurate to seven integers and to a total of 10 bytes if a decimal was included. If you SET DECI TO 0, accuracy is ten integers (whether plus or minus).

There have been times when I wanted to use absolute numbers as coordinates in an @ x,y SAY statement, and Mr. Balzowski's expression would be handy for that. Even if the result is not an integer, I've found the screen most forgiving if you send it a noninteger as a coordinate. From the dot prompt, I entered

```
. @ 10.3,10.99999 SAY "Print @ 10,10"
```

And it did.—Brad Stark

CLIPPER'S INTERACTIVE GET

A great feature of *dBASE* is its ability to READ multiple GETs. The problem is that you can't do anything with the individual GETs until the READ statement for all of them is completed.

We've come across a remarkable *Clipper* capability that actually makes individual GET statements interactive. If you were entering sales for each of 12 months, for example, your screen could show a

■ POWER USER

```
* Main program segment:
@ 10,10 GET jansales VALID CUMTOT()
@ 11,10 GET febsales VALID CUMTOT()
@ 12,10 GET marsales VALID CUMTOT()
READ

FUNCTION CUMTOT
total=jansales+febsales+marsales
@ 1,50 SAY "Running total:"+TRAN(total,"9,999,999")
* Any other programming you like can go in here.
* It will be processed as each GET is completed, eg:
* @ 2,50 SAY "State taxes:"+TRAN(total*taxrate,"9,999,999")
RETURN .T.
```

Figure 1: *An application of* Clipper'*s VALID function and UDF() capability that allows interactive GETs within a single READ statement.*

```
* Main program segment:
@ 10,30 GET mzip PICT "@9" VALID LKAREA()
@ 10,50 GET mareacode PICT "999"
@ 10,54 GET mphone PICT "999-9999"
READ

FUNCTION LKAREA
SELE B
SEEK SUBS(mzip,1,3)
mareacode=areacode
SELE A
RETURN .T.
```

Figure 2: *You can save keying time by providing intelligent defaults to subsequent GETs within a single READ.*

running total, in real time, all from within a single READ statement.

The technique involves two of *Clipper*'s unique features: the VALID function and the UDF ("User Defined Function"). The syntax is

```
@ row,col GET variable VALID UDF()
```

where UDF() is a function that always returns True, but that also performs other processing. VALID is invoked not to test validity, but to allow the UDF programming to be done on-line. Figure 1 shows an example in which you get a running total that changes as each GET is entered. You can also include other data check possibilities in your function.

John Lamont and John Miller
New York, New York

This nifty trick shows the immediate power of a function over a procedure. Since a .T. is always returned, the VALID clause becomes nothing more than an empty conduit that plugs you in directly to the user's entry for each GET as it's entered.

Many new possibilities arise. Your UDF() can run any coding you like. For example, when a state's abbreviation is keyed in you could do a lookup and flash the state's full name to minimize errors.

I've written the code fragment shown in Figure 2 to illustrate an even more powerful application: providing intelligent defaults to subsequent GETs in the same group. In this case, you have a lookup table that will provide the correct area code if you feed it the first three digits of the zip. Note that the new default value must be STOREd inside the UDF() rather than between the @ GET expressions.

If you were appending new records to a customer database with multiple contacts in a single company, you could enter the company name and have your UDF() do a lookup to provide defaults for the address, city, state, zip, and phone number—a great timesaver.

Incidentally, if you really need *a VALID expression, just tack on an .AND. with the real validating expression.*

—Brad Stark

SHOW ME A BREAK

The macro in Figure 3, which I have defined as Alt-P, allows you to move through a *WordPerfect* document displaying page breaks prominently across the middle of the screen. This is useful for making sure your page breaks fall in the right place.

The first step, <Plus key>, moves you past the currently displayed page break, if any. <PgDn> then positions you at the top of the next page. <Esc>12<Up> moves the cursor up 12 lines and pushes the page break into the middle of the screen. (I am taking advantage of the repeat function of the Esc key here.)

The final two steps, <Plus key> and <Minus key>, rewrite the screen. If you have been editing the document, there may be spurious page breaks left over from the previous text arrangement. These steps are necessary even if automatic screen rewrite is on. You could also use <F1><F1> to rewrite the screen.

Lawrence C. Stedman
Madison, Wisconsin

WordPerfect *can automatically protect against having a single line of a paragraph appear on one side of a page break. The program calls this "widow/orphan protection." However, it doesn't protect against cases like a section heading on the last line of a page. If you page through your document with this Alt-P macro, you can catch such pagination errors. You can usually*

```
<Ctrl-F10>            Begin macro definition
<Alt-P>               Call it Alt-P
<Grey+>               To bottom of screen
<PgDn>                Page down
<Esc>12<Up>           Go up 12 lines
<Grey+><Grey->        Jump to top of screen, then to bottom
<Ctrl-F10>            End macro definition
```

Figure 3: *A macro for showing page breaks.*

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90
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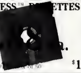

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fix the problem with a Conditional End Of Page command. For example, if a section heading is stuck at the bottom of a page, insert a CondEOP to keep it together with the first few lines of the next paragraph.
—Neil J. Rubenking

PAGE MERGING

There is an undocumented feature that significantly improves the handling of secondary merge files in *WordPerfect*. Normally, each record in a merge file ends with ^E (HRt), which you insert by using the "Merge E" key (Shift-F9). However, all merge and sort functions will perform in exactly the same manner if you substitute ^E (HPg) as the record delimiter. A simple Alt-key macro can do this in place of Shift-F9. Old files can easily be converted using search and replace.

> ■ An undocumented feature in *WordPerfect* allows me to create indexes that refer to records rather than to printed pages.

This simple change produces the following improvements: (1) When viewed on the screen, a broken line visually separates each record. (2) You can easily scroll through the file record by record using the PgUp and PgDn keys. (3) Individual records can easily be cut, copied, or deleted with the Move Page key (Ctrl-F4, 3). They can also be blocked for saving or appending to other files with PgDn, Ctrl-F4, PgUp. (4) The page counter on the status line will show the current record number. The number of the last record is the total number of records in the file. (5) You can quickly send individual records to the printer using the Shift-F7 key.

For myself, the sixth and most useful result of this change is that it allows me to create indexes that refer to records rather than to printed pages. I use secondary merge files to keep descriptions of our inventory of books for which we periodically issue catalogs. I sort these files into alphabetical order and then merge them, using the paragraph-numbering function to number each catalog item consecutively. With the ^E (HPg) record delimiter and *WordPerfect*'s index generator, I can then create a subject index from my secondary merge file whose numbers correspond to the catalog numbers. There must be numerous other similar cataloging applications where this feature would be useful.

I cannot discover any disadvantage to this arrangement and hope to see it become the standard format in the next update.

Jim Hinck
Newport, Rhode Island

The advantages of this simple change are impressive—I plan to use it myself. The simple macro to which Mr. Hinck refers would go like this:

```
<Ctrl-F10>      Start macro definition
<Alt-E>         Name it "Merge-E"
<Shift-F9>      Insert a Merge-E
<BKS>           Delete the hard return
<Ctrl-Enter>    Insert a hard page break
<Ctrl-F10>      End the macro definition
```

—Neil J. Rubenking

RULER

The macro shown below places a ruler line at the bottom of the screen. The ruler line shows the current left and right margins (even in column mode), and tab stops appear as triangles. A ruler line helps overcome some users' fear of *WordPerfect*'s infamous "blank screen." The macro (for Versions 4.1 and 4.2) is implemented by entering the following keystrokes:

```
<Ctrl-F10>    Begin macro definition
<Alt-R>       Name it ALT-R (for Ruler)
<Ctrl-F3>     Select SCREEN
1             Window
23<Return>    23 lines in this window
<Ctrl-F10>    End macro definition
```

To make this macro execute automatically when you enter *WordPerfect*, put the following command in your AUTOEXEC .BAT file:

```
SET WP=/M-ALTR
```

Kevin A. Dunn
Whitby, Ontario
Canada

You can also cause WordPerfect *to execute a particular macro on entry by invoking it with the macro name as a parameter, for example, "WP /M-MYMACRO." However, this requires that you remember to add that parameter every time you enter WP. Mr. Dunn's solution of putting the parameter in the environment with a SET command makes the macra you choose truly automatic.*—Neil J. Rubenking

MACLIBRARY

In *WordPerfect* there are only 26 Alt-key macro possibilities, and you can't use different sets of macros for different projects. By using *WordPerfect Library*, however, you can make sets of replaceable macros, each named by one key.

You use a shell macro to create and activate a set of temporary one-key macros in *WordPerfect*. Suppose, for example, you're writing an article on John Dryden. You need a set of terms specifically for that project, and you don't want to disturb your Alt-key macros. (They're probably already used up with standard functions you don't want to change.) Invoke the shell macro definition Shift-Ctrl-F10, name the macro—DRYMACS, for instance—and hit Enter. You then enter your list of temporary one-key *WordPerfect* macros thus:

■ *WordPerfect*'s widow/orphan protection doesn't protect against cases like a section heading on the last line of a page.

```
<Ctrl-F10>    Define macro
d<Enter>      Name it "d"
Dryden        The macro types "Dryden"
<Ctrl-F10>    End macro definition
```

Repeat this as many times as you have macros. When you finish, press Shift-Ctrl-F10, which ends the shell macro. Now whenever you begin to work on the Dryden article, you need only hit Alt-Shift-F10, and enter DRYMACS. Your macros will be brought into RAM, to be invoked with the single letter, Alt-F10, and Enter. This allows you to have as many sets of temporary macros as you want. If you want to alter the list once it's made, you can edit it in the *Library*'s Macro Editor.

David Kramer
Princeton, New Jersey

Mr. Kramer doesn't mention the fact that bringing the shell macra set into RAM will execute each of the macros within it. Thus, you may want to invoke the shell macro before typing any text. Also note that the one-letter macras from the shell will supersede any same-named macros in the current directory. In fact, if you attempt to define a macro called "d" while the example shell macro set is active, it will not be written to disk at all.—Neil J. Rubenking

CHECKING THE ENVIRONMENT

When developing a custom *dBASE III Plus* application, it's often useful to set up certain functions for testing that are not needed (or wanted) in the final application. SET HISTORY ON is an example.

I find the GETENV() function perfect for this. I enter SET SYSID=DEVELOP in DOS (from my AUTOEXEC), then have the *dBASE* program inquire for this value in the DOS environment:

```
IF GETENV("SYSID")="DEVELOP"
  * Set up for testing
ELSE
  * Run regular program
ENDI
```

When SYSID has not been set, GETENV() simply returns a null string.

David Griggs
West Chester, Ohio

I keep an ASCII file on the root for this same purpose, calling it SYSID.SAV. It holds a different identifying word for each of my computers.—Brad Stark

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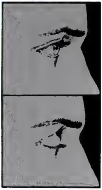

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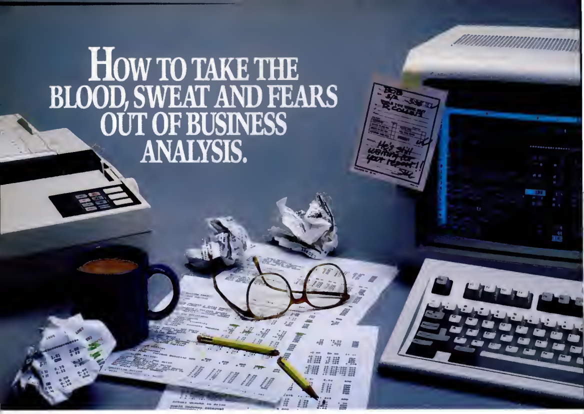

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CIRCLE 267 ON READER SERVICE CARD

■ EDITED BY ROBERT L. HUMMEL

LANGUAGES

Enhance your BASIC programs with these tips to copy files, put a color clock on-screen, and work around QuickBASIC's merge restriction.

QUICKBASIC

COPYING FILES INSIDE BASIC

I frequently need to copy files from within a BASIC program, as part of an installation procedure, for example. Though the Shell command would work, it requires COMMAND.COM, which isn't always available. A better solution is to do the copying directly in BASIC, by treating the files on a random basis.

FileCopy, listed in Figure 1, is set up as a QuickBASIC subprogram, and begins by obtaining the length of the input file. It then branches to one of two routines, depending on how many bytes are to be copied. Short files are easy to deal with because they will fit completely within the field buffers. Longer files require several passes, but the copying is acceptably fast. The speed could be further improved by increasing the size of the buffers, though this is ultimately limited by the available string space.

Steve Greiner
Carson, California

This certainly is a clever use of BASIC's random file capability, and as you observed, it eliminates the Illegal Function Call error QuickBASIC gives when COMMAND.COM isn't available. Shell doesn't work properly under DOS 2.x anyway, so this really is the best approach for distribution.

Copying files in chunks like this is even easier in Turbo Basic, because you can read and write any portion of a file using Get$ and Put$.—Ethan Winer

```
'----- FileCopy.Bas

Input "Enter the input file:  ", InFile$
Input "Enter the output file: ", OutFile$

Call FileCopy(InFile$, OutFile$)


Sub FileCopy(InFile$, OutFile$) Static

    Open InFile$ As #1 Len = 1            'get the source length
    Length = Lof(1)
    Close

    Open OutFile$ For Output As #1        'clear output file in case it
    Close                                 '  already exists

    If Length < 5000 Then                 'copy is simple for small files
       Open InFile$  As #1 Len = Length
       Open OutFile$ As #2 Len = Length
       Field 1, Length As A$
       Field 2, Length As B$
       Get #1
       LSet B$ = A$
       Put #2
    Else                                  'must copy larger files in portions
       Open InFile$  As #1 Len = 5000
       Open OutFile$ As #2 Len = 5000
       Field 1, 5000 As A$
       Field 2, 5000 As B$
       Portions = Int(Length / 5000)      'find how many 5K portions to copy

       For X = 1 To Portions
           Get #1
           LSet B$ = A$
           Put #2
           Length = Length - 5000         'Length will end up equal to the
       Next                               '  number of bytes remaining

       Close #2                           'close the output file
       Open OutFile$ As #2 Len = 1        'now open it to write single bytes
       Field #2, 1 As B$
       Len2 = Lof(2)                      'find how long it is
       Get #1                             'get the remainder of the input file

       For X = 1 To Length                'for each byte remaining
           Len2 = Len2 + 1                'increment the output file pointer
           LSet B$ = Mid$(A$, X, 1)       'get a byte from the input file
           Put #2, Len2                   'and place it into the output file
       Next

    End If

    Close                                 'all done

    End Sub
```

Figure 1: *A QuickBASIC subroutine to copy files.*

```
                Name    Clock
                Page    ,132
                Public  Clock
                Title   Clock.Asm --- by Robert J. Karp

;Syntax:        CALL Clock( row%, column%, color%, mode% )
;               Ranges:     1-25,    1-80,   0-255,   0-1

Code            Segment Byte Public 'Code'
                Assume  CS:Code, DS:Code

;--------------------------------------------------------------------------
;Data area
;--------------------------------------------------------------------------

Adapter         DB 0                            ;1 = MDA, 2 = CGA, 3 = EGA
Attribute       DB ?                            ;Requested color
Clock_Text      DB ?,?,58,?,?,58,?,?,32,?,109   ;HH:MM:SS am (or pm)
Counter         DB ?                            ;0 when time for update
Old_INT1C       DW ?,?                          ;Storage for old INT1C vector
Status          DB 0                            ;0 = Off, 1 = On
Video_Buffer    DW ?                            ;0B000h or 0B800h
Video_Offset    DW ?                            ;Location for screen display

Time            STRUC
                Hrs     DB ?                    ;Storage for hours,
                Min     DB ?                    ;minutes and
                Sec     DB ?                    ;seconds
Time            ENDS

Current_Time    Time    <>                      ;DB 3 dup(?)

;--------------------------------------------------------------------------
;Execution comes here when program is CALLed from within BASIC.
;--------------------------------------------------------------------------

Clock           Proc    Far

Begin:          PUSH    BP                      ;Save BP for BASIC
                MOV     BP,SP                   ;Get stack address
                MOV     SI,[BP+12]              ;Put row% into DH
                MOV     DH,[SI]
                DEC     DH                      ;Adjust 1-25 to 0-24
                MOV     SI,[BP+10]              ;Put column% into DL
                MOV     DL,[SI]
                DEC     DL                      ;Adjust 1-80 to 0-79
                MOV     SI,[BP+08]              ;Put color% into BL
                MOV     BL,[SI]
                MOV     SI,[BP+06]              ;Put mode% into BH
                MOV     BH,[SI]

                PUSH    DS                      ;Save BASIC's data segment
                PUSH    CS                      ;Set DS to the code segment
                POP     DS                      ;so we can find our data

                CMP     BH,0                    ;Termination requested?
                JE      Terminate               ;Yes, restore INT 1Ch address
                CMP     BH,1                    ;Installation requested?
                JNE     Exit                    ;No, exit now

;Initialize our internal variables. Then get and display the current time.

                CALL    Initialize

                MOV     AH,2Ch                  ;Get the current time
                INT     21h                     ;Call DOS to do it
                MOV     Current_Time.Hrs,CH     ;Save hours
                MOV     Current_Time.Min,CL     ;Save minutes
                MOV     Current_Time.Sec,DH     ;Save seconds

                MOV     Counter,1               ;Always display time at start-up
                CALL    Do_Clock                ;Display the current time

;Check to see if we're already installed. If not, save the ROM interrupt 1Ch
;vector and replace it with one pointing to our code.

                CMP     Status,1                ;Are we installed?
                JE      Exit                    ;Yes, exit now
                MOV     AX,351Ch                ;Get current interrupt 1Ch vector
                INT     21h                     ;Call DOS to do it
                MOV     Old_INT1C,BX            ;Save vector offset
                MOV     Old_INT1C[2],ES         ;Save vector segment

                MOV     AX,251Ch                ;Set new interrupt 1Ch vector
                LEA     DX,INT1C                ;Point it to our code
                INT     21h                     ;Call DOS to do it
                MOV     Status,1                ;Indicate we're on now
                JMP     SHORT Exit              ;Return to BASIC

;Execution jumps here on CALL from BASIC with mode%=0

Terminate:      CMP     Status,1                ;Are we installed?
                JNE     Exit                    ;No, exit now
                MOV     Status,0                ;Indicate we're turning off
                                                ;Put ROM int 1C vector into DS:DX
                LDS     DX,DWORD PTR Old_INT1C
                MOV     AX,251Ch                ;Reset interrupt 1Ch vector
                INT     21h                     ;Call DOS to do it

;--------------------------------------------------------------------------
;Program exit is achieved here when CALLed from within BASIC.
;--------------------------------------------------------------------------

Exit:           POP     DS                      ;Restore BASIC's data segment
                POP     BP                      ;Restore BP for BASIC
                RET     8                       ;Return to BASIC discarding parms
Clock           Endp

;--------------------------------------------------------------------------
;Once installed, execution comes here with each interrupt 1Ch.
;--------------------------------------------------------------------------

INT1C:          CALL    Do_Clock                ;Update clock if it's time
                IRET                            ;Return to interrupted program

;--------------------------------------------------------------------------
;DO_CLOCK increments Current_Time by 1 second once every 18 times it is
;called. The new time is sent to the display.
;--------------------------------------------------------------------------

Do_Clock        Proc    Near
                PUSH    AX                      ;Save all registers we use
                PUSH    CX
                PUSH    DX
                PUSH    SI
                PUSH    DI
                PUSH    DS
                PUSH    ES

                PUSH    CS                      ;Set DS to the code segment
                POP     DS                      ;so we can find our data
                STI                             ;Allow further interrupts
                DEC     Counter                 ;Show we're here
                JNZ     Done                    ;If not to zero, exit

                MOV     CL,60                   ;Constant divisor
                MOV     DX,0C0Ah                ;Constant divisors
                LEA     DI,Clock_Text[6]        ;Do seconds first

                MOV     AL,Current_Time.Sec     ;Seconds in AL
                INC     AL                      ;Add 1 second
                CBW                             ;Byte to word in AX
                DIV     CL                      ;Divide seconds by 60
                MOV     Current_Time.Sec,AH     ;Save seconds
                CALL    Bin_to_ASCII            ;Write seconds to Clock_Text

                MOV     AL,Current_Time.Min     ;Minutes in AL
                ADD     AL,CH                   ;Add seconds quotient
                CBW                             ;Byte to word in AX
                DIV     CL                      ;Divide minutes by 60
                MOV     Current_Time.Min,AH     ;Save minutes
                CALL    Bin_to_ASCII            ;Write minutes to Clock_Text

                MOV     AL,Current_Time.Hrs     ;Hours in AL
                ADD     AL,CH                   ;Add minutes quotient
                MOV     Current_Time.Hrs,AL     ;Save hours
                CBW                             ;Byte to word in AX
                DIV     DH                      ;Correct for hours > 12
                CMP     AH,0                    ;Noon or midnight?
                JNE     Cont                    ;No, continue
                MOV     AH,12                   ;Yes, change 0 to 12
Cont:           CALL    Bin_to_ASCII            ;Write hours to Clock_Text

                MOV     Clock_Text[9],'p'       ;Assume pm for now
                CMP     CH,1                    ;Afternoon or evening?
                JE      Write_Time              ;Yes, display the time
                MOV     Clock_Text[9],'a'       ;No, write 'am'

Write_Time:     MOV     ES,Video_Buffer         ;Set ES to screen segment
                LEA     SI,Clock_Text           ;Point SI to text storage
                MOV     AH,Attribute            ;Color to use in AH
                MOV     DI,Video_Offset         ;Get display location
                MOV     DX,3DAh                 ;CGA Mode Status Register in DX
                MOV     CX,11                   ;11 characters to print
                CLD                             ;Clear DF for string moves

Output1:        CMP     Adapter,2               ;Are we doing CGA?
                JNE     Output2                 ;If not, skip the retrace stuff
No_Retrace:     IN      AL,DX                   ;Get the video status byte
                TEST    AL,1                    ;Horizontal retrace active?
                JNZ     No_Retrace              ;Yes, wait until it's over
Retrace:        IN      AL,DX                   ;Get the video status byte again
                TEST    AL,1                    ;Horizontal retrace active?
                JZ      Retrace                 ;No, wait until the next one
Output2:        LODSB                           ;Character in AL
                STOSW                           ;Display character/attribute pair
                LOOP    Output1                 ;Continue until done CX times

                MOV     Counter,18              ;Start count over again

Done:           POP     ES                      ;Restore all registers
                POP     DS
                POP     DI
                POP     SI
                POP     DX
                POP     CX
                POP     AX
                RET
Do_Clock        Endp

;--------------------------------------------------------------------------
;BIN_TO_ASCII converts a single hex byte to its 2 character ASCII equivalent
;and stores those characters in Clock_Text.
;--------------------------------------------------------------------------

Bin_to_ASCII    Proc    Near
                MOV     CH,AL                   ;Save prior quotient in CH
                MOV     AL,AH                   ;Put number into AL
                CBW                             ;Byte to word in AX
                DIV     DL                      ;Divide AL by 10
                ADD     AL,48                   ;Convert quotient to ASCII
                MOV     [DI],AL                 ;Store digit in Clock_Text
                INC     DI                      ;Point to next digit
                ADD     AH,48                   ;Convert remainder to ASCII
                MOV     [DI],AH                 ;Store digit in Clock_Text
                SUB     DI,4                    ;Point DI to 3rd prior digit
                RET
Bin_to_ASCII    Endp

;--------------------------------------------------------------------------
;INITIALIZE sets the values of various parameters required during execution.
;--------------------------------------------------------------------------

Initialize      Proc    Near

;Derive the offset address in video memory for location row%, column%.

                MOV     AL,160                  ;160 bytes per row
                MUL     DH                      ;AX = offset value of row%
                SHL     DL,1                    ;column% * 2
                XOR     DH,DH                   ;Byte to word in DX
                ADD     AX,DX                   ;Add the two
                MOV     Video_Offset,AX         ;Store offset internally

                MOV     Attribute,BL            ;Store color% internally

;Identify the display type and set monitor-dependent values accordingly.

                CMP     Adapter,0               ;Have we done this before?
                JNE     Init_Exit               ;Yes, don't repeat
                MOV     AX,40h                  ;Set ES to the BIOS data segment
                MOV     ES,AX
                MOV     BX,0B000h               ;Set Monochrome segment for now
                MOV     DL,1                    ;Set Monochrome adapter for now
                MOV     AL,ES:[10h]             ;Get equipment list low byte
                AND     AL,110000b              ;Clear bits 0 - 3
                CMP     AL,30h                  ;Monochrome adapter?
                JE      Save_Values             ;Yes, save values
                ADD     BX,800h                 ;Set BX to color screen segment
                INC     DL                      ;and increase DL to 2
                MOV     AL,ES:[87h]
                CMP     AL,0                    ;Is an EGA installed?
                JE      Save_Values             ;No, leave DL set to 2
                INC     DL                      ;Yes, increase DL to 3
Save_Values:    MOV     Video_Buffer,BX         ;Save the screen buffer address
                MOV     Adapter,DL              ;Save our adapter code
Init_Exit:      RET
Initialize      Endp

Code            Ends
                End     Begin
```

Figure 2: *The assembly language program to create CLOCK.OBJ.*

SPRINGING BAIL IN QB

I recently encountered a problem using Microsoft's QuickBASIC, Version 2.01. When I attempted to return to editing a program after using *SideKick*, I found that the computer had completely locked up. I was so upset at the possibility of losing my program that I figured there was nothing to lose by trying different key combinations. I discovered that by pressing the Alt-End key combination and then Alt-Home, the system could be brought to normal.

Jeff Tange
San Diego, California

Microsoft played a dirty trick on us all when the company decided to exclude the use of resident keyboard handlers in QuickBASIC. Fortunately this has been fixed in Version 3.0, though I still can't export text from SideKick *into the QuickBASIC editor.*

Until they get around to adding a merge capability, you can use this technique: First mark the block of text in the source program and press F2. Then load the destination program and put the cursor at the point where the text is to be merged. Finally, use the Ins key to paste the original text.
—Ethan Winer

BASIC

KEEPING BASIC TIME

The October 14, 1986 issue of *PC Magazine* (Volume 5 Number 17) presented a Turbo Pascal program that would display a real-time clock on the screen. To accomplish the same thing in BASIC, one could use the On Timer/Gosub command to display the time at regular intervals. The use of event trapping, however, will make a program larger and run slower.

As an alternative to On Timer I have written CLOCK.ASM, shown in Figure 2, which achieves the same result by intercepting the system clock interrupt. Though it is invoked 18 times per second, it only displays the time once each second. It is meant to be assembled and linked to a QuickBASIC or BASCOM main program, and will therefore not operate with BASIC interpreters. You could also put CLOCK in a QuickBASIC user library, to run it while in the QB editing environment.

The syntax for using CLOCK is

```
Call Clock(Row%, Column%, Colr%, Mode%)
```

where *Row%* and *Column%* are integer variables that indicate where on the screen to display the time, *Colr%* is the color to use, and *Mode%* is 1 to install CLOCK and 0 to uninstall it. You may install the program more than once, for example, to change the row and column or the display colors. By the way, both the foreground and background colors are contained in a single byte, which can be calculated with the formula

■ LANGUAGES

```
Colr% = FG + 16 * BG
```

It is *very important* to remove CLOCK before your BASIC program terminates. I also recommend that you add it to your programs only after they have been thoroughly tested. If a program ends before CLOCK has been removed, the big red switch will be your only recourse.

Robert J. Karp
Lake Zurich, Illinois

Most memory-resident programs are meant to be installed from DOS, and the ability to intercept hardware interrupts in BASIC like this is a powerful addition indeed. The ability to reinstall the program to establish a new location or display color is particularly clever. This technique opens up interesting possibilities, such as a keyboard interrupt handler that could test for undetectable combinations like Ctrl-Alt.—Ethan Winer

■ The ability to reinstall the program to establish a new location or display color is particularly clever.

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Robert L. Hummel is senior technical editor on the staff of PC Magazine. *Ethan Winer, an independent consultant, is the head of Crescent Software in East Norwalk, Connecticut. He is a contributing editor of* PC Magazine.

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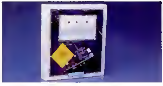

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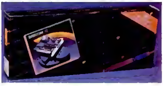

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CIRCLE 482 ON READER SERVICE CARD

■ ROBERT L. HUMMEL AND CHARLES PETZOLD

PC TUTOR

COPYing confusions about DRIVER.SYS; copying 1.2-meg floppies on the same drive; removing illegal characters in filenames and directories; storing over 224 files on a floppy.

SWAPPING DISKETTES LOGICALLY

Using the DOS DRIVER.SYS command in my CONFIG.SYS file, I set up my normal A: drive as logical drive D:. But things get confusing when I try to copy a file from drive A: to drive D:, using the DOS 3.2 COPY or XCOPY commands. The first message I get says to insert a diskette for drive D:, then insert one for drive A:, then in drive D:, then in drive A:. I thought the diskette would go first in the source drive, then in the target drive. Surely this shuffling of diskettes is incorrect.

Raymond Martin
Temple, Texas

DRIVER.SYS was IBM's solution to the problem of letting us copy files between disks using the same drive. The large number of disk changes required by DOS during a copy is caused by the copy commands themselves. The COPY command copies one file at a time from source to target. If you issue the command

```
COPY  A:*.*  D:*.*
```

DOS will read one file from the source diskette in drive A:, ask you to swap diskettes, and write that one file to the target diskette in logical drive D:. To read the next file, it must ask you to replace the source diskette and begin again. Using this method to copy more than one file, or a large file that must be transferred in pieces, can become tiring very quickly.

XCOPY.COM, a recent DOS addition, will read as many files from the source diskette as will fit into memory before it writes to the target. Therefore, XCOPY does not require disk changing as often as COPY. However, because XCOPY can be used to copy directories as well as files, it requests a disk swap immediately to read the directory of the target disk before it will begin copying.

So, my advice is simply to trust the prompting messages DOS gives you when copying between different logical drive letters for the same physical drive, while heeding two warnings. First, when the data is irreplaceable, put a write-protect tab on the source disk, just in case you get mixed up. And second, press Ctrl-Break when you are through copying. This forces DOS to flush the disk buffers and reduces the likelihood of destroying data in drives that can't tell when a disk has been changed.—Robert L. Hummel

ADDING LOGICAL DRIVES

I have an AT compatible running MS-DOS 3.2 with a 1.2-meg floppy as drive A:, a 360K floppy as drive B:, a 20-meg hard disk as drive C:, and a RAMdisk as drive D:. To copy files from one 360K disk to another, I use drive A: as the source and drive B: as the target. But since the 360K drive can neither read nor write 1.2-meg disks, how can I copy files from one 1.2-meg disk to another? Is this what the DRIVER.SYS program is for?

Jim Culbertson
Philadelphia, Pennsylvania

> ■ XCOPY.COM, a recent DOS addition, will read as many files from the source diskette as will fit into memory before it writes to the target.

Until the DRIVER.SYS device driver was introduced in DOS 3.2, copying files between 1.2-meg disks was a problem. DISKCOPY has always allowed an entire disk to be copied using a single drive, by specifying the same drive letter for the source and target drives and prompting for disk changes. The command format is

```
DISKCOPY A: A:
```

The DOS COPY command does not allow files to be copied between different disks using the same drive, however. Attempting to copy single files to the same disk generates an error message or may destroy data. DRIVER.SYS solves this problem by assigning a second drive letter to represent an existing physical drive. The driver keeps track of which disk is in the drive and prompts you for changes in the same way as a system with a single floppy drive can use it as both A: and B:.

DOS automatically loads a disk device driver for an internal drive at boot-up. By including the line DEVICE = DRIVER.SYS in your CONFIG.SYS file, two drive letters are assigned to that internal

```
DEVICE = DRIVER.SYS /D:ddd [/T:ttt] [/S:ss] [/H:hh] [/C] [/N] [/F:f]
```

Figure 1: *The syntax for the DEVICE = DRIVER.SYS command.*

```
DEVICE = DRIVER.SYS /D:0 /T:80 /S:15 /H:2 /C /F:1
```

Figure 2: *When placed in your CONFIG.SYS file, this command will create a logical drive E: for use with a 1.2-meg physical drive A:.*

drive. The syntax for the command is shown in Figure 1. The parameters are as follows:

*/D:*ddd *specifies the physical drive number, which has the value 0 through 255. The first diskette drive (A:) is number 0. The first hard disk is number 128 (80H).*

*/T:*ttt *specifies the number of tracks per side. The default is 80.*

*/S:*ss *indicates the number of sectors on each track and defaults to 9.*

*/H:*hh *is the maximum number of heads (sides). The default is 2.*

/C is used when the disk drive has hardware built in to detect when a disk has been changed. This is used for 1.2-meg drives.

/N (nonremovable) is used for hard disks.

/F:f specifies the device type (form factor). The default is 2. The allowable values are shown here.

VALUE	DEVICE
0	160K/180K (SSDD)
0	320K/360K (DSDD)
1	1.2M (HD)
2	720K or others
7	1.44M

To create a logical drive E: that uses your 1.2-meg physical drive A:, use the values in Figure 2 in your CONFIG.SYS file.

Now files can be copied between 1.2-meg disks using the command

```
COPY A:filename E:filename
```

—Robert L. Hummel

FILLING IN THE BLANKS

We have a couple of PC-XTs that use *PFS: Write* word processing software. The problem is that when users started naming files, they used names like "MY PRICE". How do you get rid of files with blanks in the name? DOS does not recognize these names, nor does the *PFS* program.

Timothy Cannon
Kuttawa, Kentucky

While learning a *Samna* word processor, someone accidentally created some subdirectory names with spaces in them. When I try to use RMDIR, DOS gives me an error message. TREE prints out a listing, but reports an error when it tries to reach the subdirectories below the one with a space in it. How can I remove these subdirectories?

John Cummings
Atlanta, Georgia

Spaces in file and subdirectory names cause quite a bit of confusion. A number of applications, particularly word processors, let you create "illegal" names, but COMMAND.COM won't let you remove them.

This problem illustrates the difference between using the DOS function calls directly and using them through the command interpreter, COMMAND.COM. When an application works with file and subdirectory (a special type of file) handling functions, it passes the filename as an argument, either in a File Control Block (FCB) or as an ASCIIZ string (a series of ASCII characters followed by a zero byte). Spaces and other special characters can be included in the filename without causing an error. When you try to reference the file at the command line, however, COMMAND.COM interprets the spaces as separators and won't allow you to reference the file.

To remove spaces in filenames, you have to "fool" COMMAND.COM by using wildcard characters. In DOS, the character "?" can represent any single character in a filename. Assume you have a file with the name "MY PRICE". To re-

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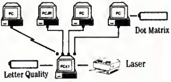

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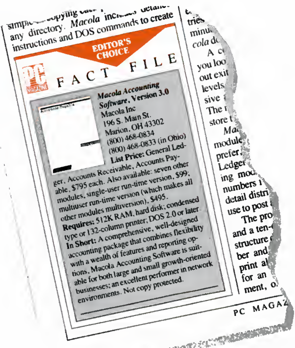

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name that file, use the command

```
RENAME MY?PRICE MY-PRICE
```

DOS will find the file because the "?" wildcard will mask the space. The new name can be any valid filename.

Subdirectories with strange names cannot be handled the same way, however, since the REName command does not work with directory names. While the subdirectories cannot be renamed, they can be removed by using the BASICA interpreter. In order to be removed, the directory must be empty, so delete all files and remove all subdirectories below the offending directory. Make sure you back up any files you wish to keep. Next, go to the parent of the directory you wish to remove. For example, if the full directory path was

```
C:\LEVEL1\LEVEL2\ABC DEF
```

you would enter

```
CD \LEVEL1\LEVEL2
```

Start BASICA by typing "BASICA" at the command line. Now enter

```
RMDIR "ABC DEF"
```

and the directory should disappear.
—Robert L. Hummel

LIMITS TO BACKUP

We are currently using 1.2-megabyte diskettes to back up files from the 20-meg hard disk on our AT. Most of the files we generate are very small (less than 2K).

The problem is that during the DOS 3.1 BACKUP procedure we have run into the arbitrary upper limit of 223 files allowed on any one diskette, even if less than half the available space on the disk has been used up.

How can we get full use of our 1.2-meg diskettes and drive?

Mark Meyering
Meriden, Connecticut

The limit you hit is not exactly "arbitrary." A 1.2-megabyte drive allocates 14 512-byte sectors to hold the root directory. Each directory entry requires 32 bytes, so only 224 files can be stored in the root directory. (If you assign a volume label to the diskette during formatting, that's a directory entry itself. That's where your 223-file limit is probably coming from.)

You can store more than 224 files on a 1.2-megabyte diskette by using a subdirectory. Subdirectories do not have any size restriction that limits the number of files they can hold. However, BACKUP can only copy files to a root directory.

Probably the best solution in your case is to use something other than BACKUP, so you can store files in a subdirectory on

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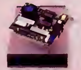

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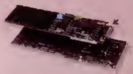

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the diskette rather than the root directory. For instance, the XCOPY program included with PC-DOS 3.2 has many of the features of BACKUP (such as only copying files that have been changed, or changed after a particular date), it's faster, and it can copy to a subdirectory. Unlike BACKUP, XCOPY does not add a header to the files that makes them unusable without RESTORE.

Some disadvantages of XCOPY, compared with BACKUP, are that it cannot copy a file larger than target disk size and that it cannot prompt for a new disk. However, if you use the /M flag (to copy only files changed since the last XCOPY or BACKUP), you can reiterate the XCOPY command until everything is backed up.

You might also reevaluate the efficiency of a system on the AT that is responsible for creating all these tiny files. It sounds like a database application that might be better handled with everything in one big file. —Charles Petzold

FILE FORMATS

I'd like to know the internal formats of such files as .WKS (Lotus's *1-2-3*), .DIF, .DBF (*dBASE II*), and so forth. Where can I get such information?

David Nieves
Chesapeake, Virginia

Try the book File Formats for Popular PC Software, *by Jeff Walden. The ISBN number is 0-471-83671-0, and it is published by John Wiley & Sons Inc., 605 Third Ave., New York, NY 10157. It shows the data file formats used by* 1-2-3 *(Releases 1A and 2),* Symphony, Ability, dBASE II, dBASE III, MultiMate, MultiPlan, IBM Plans+, SuperCalc3, VisiCalc *(including .DIF),* WordStar, *and* WordStar 2000. —Charles Petzold

ASK THE PC TUTOR

The PC Tutor solves practical problems and explains points of general interest. To see your questions answered here, drop a line to PC Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016.

Robert L. Hummel is senior technical editor on the staff of PC Magazine. *Charles Petzold is a contributing editor of* PC Magazine.

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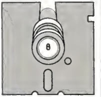

On needing NETBIOS; fighting unwanted form-feeds; restructuring file fragments; sharing memory with Symphony; and running an ARCnet "recon."

NOVELL ERROR MESSAGE

Our Novell network gives us an "Insufficient Network Resources" message when we try running an electronic mail program and an asynchronous gateway. Any idea what that means?

Robert Abbington
Greenville, South Carolina

That's an easy one. The programs you are trying to run need NETBIOS to establish communications sessions between the network nodes. The Novell network doesn't normally respond to NETBIOS calls, but it has a NETBIOS emulator that can be called when the system is initiated. Just type NETBIOS when you are in the PUBLIC subdirectory or call it at start-up in a batch file.

FORM-FEEDS IN PC LAN

We use our IBM *PC Local Area Network Program* to run *dBASE III Plus* and *MultiMate* applications. Our only real problem is that the IBM printer-sharing software always ejects a page after each print job. This wastes the preprinted forms we use. Is there any way to stop *PC LAN* from sending a form-feed between jobs?

B. Pham
Anaheim, California

Reader Pham is not the only person writing to complain about PC LAN *sending unwanted form feeds. I can't find any documented or undocumented commands (including NET SEPARATOR /D) that seem to work. Has anyone out there solved this problem?*

NOVELL FILE FRAGMENTATION

I am curious about file fragmentation on network servers. If files are fragmented all over the disk, it seems that it would take longer to search for and retrieve them.

Does a Novell file server automatically reconfigure the locations of files to avoid fragmentation? Is this a function available through some other means like the Novell VRepair program? Is this worth worrying about?

Tim Garnto
Tallahassee, Florida

Yes, it is worth worrying about in some situations. In applications in which people frequently change, expand, and rewrite a large number of records, we have seen disk access times increase substantially. Disk caching helps mitigate the effects of fractured files, but only after the first retrieval and only if the record is not changed.

In network programs that use the standard IBM file format (3Com's 3+Share, *Fox Research's* 10-NET, *IBM's* PC LAN*), some of the hard disk utilities that restructure file segments will improve performance. But you can't use these DOS utilities on the disk of a Novell server.*

Novell doesn't have any comparable utilities. VRepair (available through your Novell dealer) searches the disk and looks for media problems that might have developed. It adds the locations with problems to the bad block list. It will clean up directories and file allocation tables, but it is not able to restructure files.

As I've said before in this column, the best treatment for a busy Novell system is to periodically back up the files, run the Novell CompSurf utility against the disk, and restore the disk on a file-by-file basis.

■ The best treatment for a busy Novell system is to back up files, run the Novell CompSurf utility, and restore the disk file by file.

SYMPHONY SMASHES EMULATOR

I have a problem that I solved, and maybe other readers of Connectivity Clinic can use the information.

Our application requires using *Symphony*, Version 1.2, and the IBM 5250 emulation software on IBM PC-XTs with expanded memory cards. The XTs are connected to an IBM System 38. When I loaded the emulation program in the AUTOEXEC.BAT file and then tried to load *Symphony*, the XT froze and had to be cold-booted. We found that the order in which the programs were loaded made no difference. IBM, AST (maker of the EMS cards), and Lotus were no help in correcting the problem.

Through trial and error I found that if

Symphony is loaded first and a worksheet is retrieved, then *Symphony* can be exited normally and the 5250 emulation can be loaded. If you then reload *Symphony*, you can "hot key" back and forth between PC mode running *Symphony* and terminal mode without locking up. Evidently, when *Symphony* is loaded it somehow manipulates memory and prevents other programs (like the 5250 emulator) from sharing it. Retrieving a worksheet file somehow puts *Symphony* into a mode in which it can share memory.

This procedural solution works, but does anyone have any other solutions for this problem or comments about why it acts the way it does?

George Latimer
Bradenton, Florida

■ When *Symphony* is loaded it somehow manipulates memory and prevents other programs (like the 5250 emulator) from sharing it.

Congratulations on your work-around. You have more patience than I. While I doubt that anyone in the Connectivity Clinic audience has a better solution, let's put it up for grabs. Any takers?

ARCNET RECON

What is a "recon"? One of the people in the crew who installed our ARCnet network says that whenever stations enter the network, the system has to go through a "recon," and that it slows down operation. Is this right?

Robert Hutchison
Sumter, South Carolina

Yes and no. A "recon" or reconfiguration takes place whenever an ARCnet network is powered-up the first time or a station is added or deleted. ARCnet operates under a token-passing protocol. Each node in an ARCnet system has a unique ID that is usually set into a DIP switch on the controller board. The token is passed from station to station according to the IDs that are known to be active on the network.

When a PC is powered-up, it destroys the token (but not data packets being transferred), halting network activity. The highest-numbered PC then locates its next node

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■ Avoid frequently turning network stations off and on during heavy processing times.

in the sequence by addressing the token to incrementing addresses until it gets a response. The next active node repeats the procedure. When the token has been addressed to all 255 possible node numbers, the reconfiguration is complete and network activity is resumed. Similar activity occurs when a node leaves the network and does not respond.

However, as complex as this sounds, it all takes between a minimum of 24 and a maximum of 61 milliseconds. In rough terms, this is like one disk access.

A process similar in concept but very different in execution takes place in a token-ring network such as Proteon's ProNET-10 or the IBM Token-Ring Network.

In the most technical sense, you should avoid frequently turning network stations off and on during heavy processing times in both the ARCnet and Token-Ring networks, but in most practical installations a reconfiguration of the ring will not affect network performance.

NETWORK YOUR QUESTIONS

Connectivity Clinic gives you practical solutions to networking programs of all types. We'll pay $50 for any tips we print, *plus an extra $25 if you submit your letter on a disk*, and we'll gladly answer any questions you have, at no charge. We're sorry, but we're unable to answer letters personally.

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Frank J. Derfler, Jr., is a contributing editor of PC Magazine.

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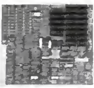

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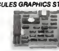

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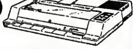

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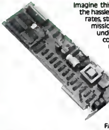

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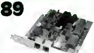

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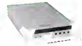

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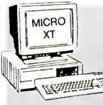
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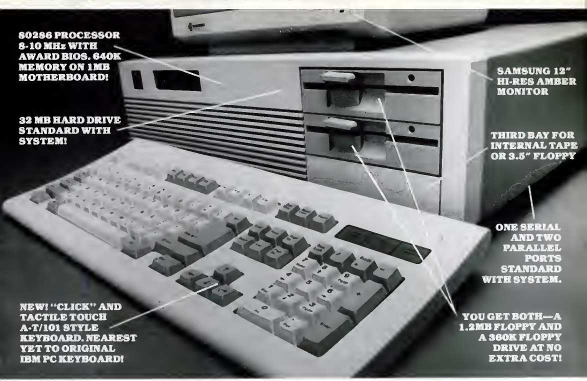

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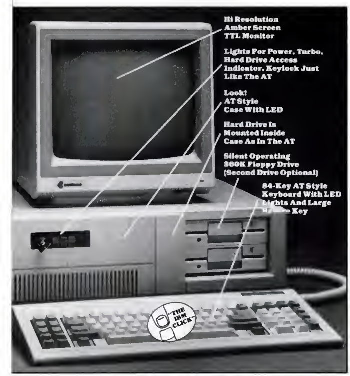
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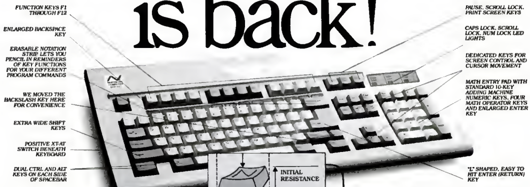
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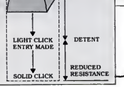

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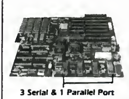
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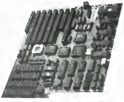

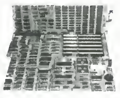

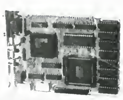

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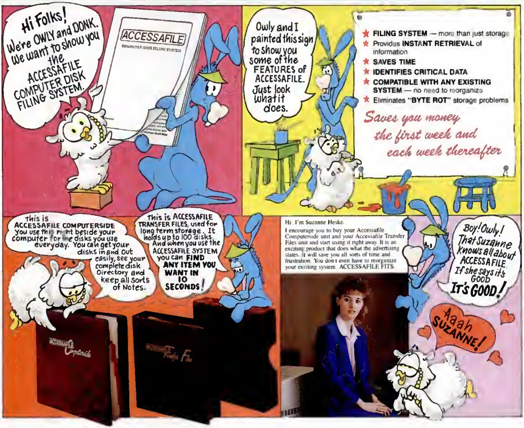
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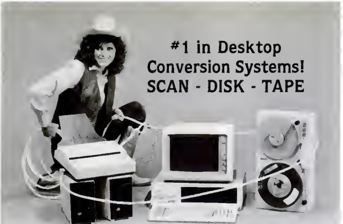
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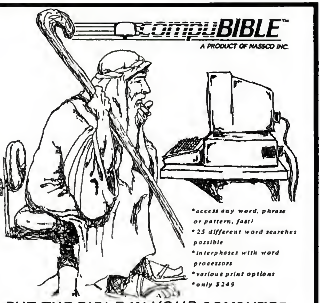
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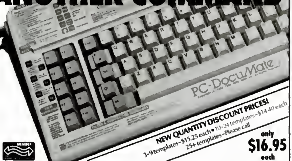

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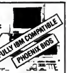

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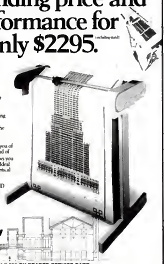

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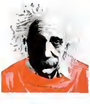

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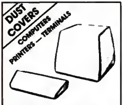

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SPREADSHEETS Since its release in January 1982, Lotus Development Corp.'s *1-2-3* has become the spreadsheet standard and the world's largest-selling single software program. But new challengers are entering the market, and some of the old are back out in newer, better versions. Can any seriously challenge *1-2-3*? Take a look at 14 *1-2-3* challengers, including the new 3-D spreadsheets.

COMPUTERS Three new laptops from Datavue, Tandy, and IBM have joined the race in the small and portable market. Executive editor Bill Howard heads the test team as they put these computers through DOS-to-go trials.

19-INCH EGA MONITORS Contributing editor Winn L. Rosch screen-tests six big EGA or higher-resolution monitors: Aydin's Patriot Enhancer, Conrac's Model 7250 Auto-Trak, Epsilon Graphics' EG-19 Enhanced Graphics Display, Electrohome's Vari-Scan ECM1910, Microvitec's 1019 Definition Autosync, and Intecolor's MegaTREND.

VOICE-RECOGNITION DEVICES Winn L. Rosch reviews 15 voice-recognition systems. The best of these PC add-ons can identify a vocabulary of 1,000 words and then transmit these words as ASCII characters to any PC.

386 TURBO BOARDS These long-awaited boards are beginning to arrive on the market. Howard Marks reviews the Intel Inboard/386, the American 386 Turbo, the PC-Elevator 386, and the Cheetah Adapter/386.

CONNECTIVITY The connectivity series continues with a look at AT&T's 3B2/600 UNIX-based minicomputer that can double as a server for PCs on a StarLAN network and as a host to asynchronous terminals.

BACKUP SOFTWARE All of us should back up data. Few of us do. Vincent Puglia looks at 18 programs that can help you with the task.

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1. In which of the following sectors does your organization operate? (Check one.)
a. ☐ Private Industry
b. ☐ Government
c. ☐ Education

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d. ☐ MIS/DP, Communications Systems, Programming
e. ☐ Engineering/R&D
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3. Is your company a reseller?
i. ☐ Yes
j. ☐ No

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k. ☐ 10 or less
l. ☐ 11-25
m. ☐ 26-100
n. ☐ 100 or more

5. Are PC's in your office
o. ☐ Linked to mainframe
p. ☐ Linked to mini
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6. Does your company own
r. ☐ Mainframe(s)
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7. Do you plan to to buy
t. ☐ Now
u. ☐ In 4 to 6 months
v. ☐ In 6 to 12 months
w. ☐ No definite plans

8. Number of employees in your company:
x. ☐ 25 or less
y. ☐ 26-99
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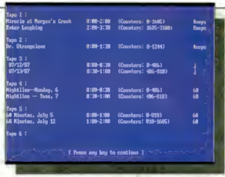

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Enter Laughing                2:00-3:30   (Counters: 1605-3100)   Keeps

Tape 2 :
Dr. Strangelove               0:00-1:30   (Counters: 0-1244)      Keeps

Tape 3 :
 07/12/87                     0:00-0:30   (Counters: 0-406)       [illegible]
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60 Minutes, July 12           1:00-2:00   (Counters: 810-1605)    60

Tape 6 :

              [ Press any key to continue ]
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Video Wizard *lets you look at your tape collection from several aspects: cataloged by individual tape, by free space, or by subject matter.*

ART & LEISURE

Video Wizard: For the Home Taping Club

BY GUS VENDITTO

When some people see new technology, they see progress in the human condition. Others see a marketing opportunity.

The folks who bring you *Video Wizard* understand that anybody who uses a VCR for home taping quickly loses track of where that "David Letterman Show" from last Friday went—was it consumed by "Monday Night Football," or was that the time you picked the wrong channel and got the "Home Shopping Club" instead? Home taping is a hornet's nest that the PC is now ready to clean up.

If you've got the discipline to sit down at the PC and log the correct tape and counter number whenever you tape a movie, *Video Wizard* could be a godsend. It understands VHS: it will sort out tape speeds and convert tape counter numbers to minutes and seconds.

Of course, if you don't have enough discipline to write the name of a show directly on a tape's label before you put it away on a shelf, you probably won't have the discipline to use *Video Wizard* either.

List Price: *Video Wizard*, $59.95
Requires: 256K RAM, one disk drive, DOS 2.0 or later. Not copy protected. IntraCorp. 13500 N. Kendall Dr. #185, Miami, FL 33186; (305) 382-6567.

CIRCLE **669** ON READER SERVICE CARD

ON-LINE SERVICES

Call on GEnie for Some Nighttime Magic

BY CATHERINE D. MILLER

By day, General Electric Information Services Co. provides private data communications services to business. At night, the network goes public with GEnie (General Electric Network for Information Exchange).

Like CompuServe (see review, After Hours, *PC Magazine*, Volume 6 Number 14), GEnie offers on-line entertainment and downloadable programs. Unlike CompuServe, GEnie is targeted only to home users and is not vying for serious business users: the prime connect rate is seven times the nonprime rate. But GEnie's nonprime rate is less than half the rate charged by CompuServe or The Source.

GEnie's Roundtables allow you to share programs and information with other GEnie subscribers. The IBM PC roundtable libraries include an abundance of downloadable software. In the Games and Entertainment library alone, I found nearly 4,500 programs. There are also roundtables on topics ranging from Science Fiction and Fantasy to Scuba.

In GEnie's Game Room you will find over a dozen text games to play on-line. Some, like *Black Dragon* and *Castle Quest*, are easy to enjoy. Others, like Stellar Emperor and *Stellar Warrior*, require a commitment of time (and money) to learn.

GEnie also offers a gateway to American Airlines EAASY SABRE at no extra cost. And the News, References, and Financial menu gives you access to numerous publications, including Grolier's electronic encyclopedia.

List Price: GEnie, sign-up fee, $18. Nonprime connect rate, $5 per hour at 300 and 1,200 bps; prime connect rate, $35 per hour; $10 surcharge per hour for 2,400 bps.
Requires: Serial port, modem, communications software. General Electric Information Services Co., 401 N. Washington St. Rockville, MD 20850; (301) 294-5647.

CIRCLE **668** ON READER SERVICE CARD

ART & LEISURE

Your Personal Poet: The Friendly Ghostwriter

BY MICHAEL COHN

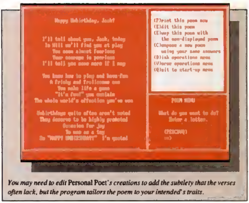
Even the best-stocked greeting-card shops don't cover every occasion. But *Your Personal Poet* can write a three-verse message to anyone and print it out on the glue-stripped paper and all-purpose greeting cards enclosed with the software. It lets you personalize your missives and edit them if you're not satisfied with the program's handiwork.

The program guides you along the creative path, letting you choose the type of message (anything from risqué to merely timely), your addressee's traits, and whether you want the poem styled in limerick form or sentimental blank verse.

It won't stand up next to Robert Frost, but it might get a better reception than a Hallmark card.

List Price: *Your Personal Poet*, $9.95. **Requires:** 256K RAM, one disk drive, DOS 2.0 or later. Not copy protected. Door Openers Inc., 775 E. Greg St., Sparks, NV 89431; (702) 359-8200.

CIRCLE **667** ON READER SERVICE CARD



```
Happy Unbirthday, Jack!

I'll tell about you, Jack, today
In [illegible] we'll find you at play
You seem almost fearless
Your courage is peerless
I'll tell you some more if I may

You know how to play and have fun
A frisky and frolicsome one
You make life a game
"It's fun!" you exclaim
The whole world's affection you've won

Unbirthdays quite often aren't noted
They deserve to be highly promoted
Occasion for joy
To use as a toy
So "HAPPY UNBIRTHDAY!" I'm quoted
```

```
(P)rint this poem now
(E)dit this poem
(S)wap this poem with
  the non-displayed poem
(C)ompose a new poem
  using your same answers
(D)isk operations menu
(V)erse operations menu
(Q)uit to start-up menu
```

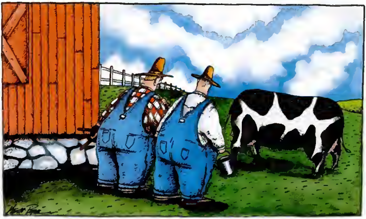
```
POEM MENU

What do you want to do?
Enter a letter.

(PESCDVQ)
==>
```

You may need to edit Personal Poet's *creations to add the subtlety that the verses often lack, but the program tailors the poem to your intended's traits.*

Nord and Bert Couldn't Make Head or Tail of It™



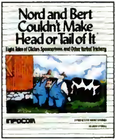
Eight Tales of Cliches, Spoonerisms, and Other Verbal Trickery

Infocom's first collection of short stories takes you to a place where nothing is quite as it seems. It's a place where you really can make a mountain out of a molehill, where 'the fur is flying' is taken literally, where a bow can be turned into a beau, and where you'll need to shake a tower before you can take a shower.

Each of the eight stories in *Nord and Bert Couldn't Make Head or Tail of It* involves a different type of wordplay. You'll find yourself challenging your wits and your memory to come up with the cliches, spoonerisms, and other verbal trickeries needed to complete the puzzles. But don't view this as a hard row to hoe. *Nord and Bert* contains built-in hints, which you can call upon when the going gets rough.

All eight stories take place in the mixed-up Town of Punster. However, no two contain the same people, locations, or objects. Each is played independently of the others, although you'll use passwords obtained in seven of the stories to get into the eighth. As for mapping, it's out the window. You simply type where you want to go—the accessible locations are listed at the top of the screen.

Infocom's interactive fiction gives you the leading role in a vividly-descriptive story. In *Nord and Bert Couldn't Make Head or Tail of It,* author Jeff O'Neill has created a clever collection of tall tales that can each be completed in one sitting. You'll enjoy playing them alone or with friends, as you visit a place where the turn of a phrase makes the world go round.


Nord and Bert Couldn't Make Head or Tail of It
Eight Tales of Cliches, Spoonerisms, and Other Verbal Trickery
INFOCOM

INFOCOM™

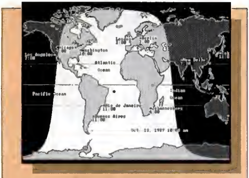
125 CambridgePark Drive
Cambridge, MA 02140

Infocom interactive fiction is available for most personal computers.

Nord and Bert Couldn't Make Head or Tail of It is a trademark of Infocom, Inc.

CIRCLE 300 ON READER SERVICE CARD

AFTER HOURS



Terminator shows the difference between day and night, the circle east of Brazil represents the spot where the sun is overhead

REFERENCE

Terminator: A Global Perspective for $39.95

BY GUS VENDITTO

If you like to get the big picture, you'll love *Terminator*, a gem of a program that projects the slow march of day and night across the planet. Named for the planet-wide line that separates day from night, *Terminatar* was inspired by the GeoChron, a $1,700 wall-sized mechanical gizmo that's used by many airlines to help in flight planning. The GeoChron is also a toy for the likes of Malcolm Forbes and other well-heeled continent-hoppers.

For $39.95, *Terminatar* gives you the same view you get from the GeoChron but puts more godlike powers at your disposal.

Turn on the speed mode, and a year elapses before your eyes in a matter of minutes. Want to see when dusk will cross the Rockies on October 29, 1988? Push the terminator forward with the Plus key.

Easily changed configuration files let you display cities of your choosing.

This may not be the most useful program you'll ever own, but it'll give you one of the most breathtaking views you'll ever have on your screen.

List Price: *Terminator*, $39.95.
Requires: 38K RAM; one disk drive; Hercules, CGA, or EGA; DOS 2.0 or later. Not copy protected. Spite Software, 4004 SW Barbur Blvd., Portland, OR 97201; (800) 423-3500.

CIRCLE **671** ON READER SERVICE CARD

☑ PERSONAL GROWTH

The Evelyn Wood Dynamic Reader: Absorb More in Less Time

BY JENNIFER ZAINO

I've always been an avid reader, devouring books the way some people binge on chocolate chip cookies. But I've never read with much speed. I hoped that *The Evelyn Waad Dynamic Reader* program, from Timeworks, would teach me the skills I needed to get through even more "cookies" each month. And for the most part, I was not disappointed.

Like Addison-Wesley's *Smart Eyes* speed-reading program (see After Hours, *PC Magazine*, Volume 6 Number 14), part of *The Dynamic Reader* course focuses on exercises that condition your eyes to move rapidly across a page. The popular moving-dot exercise, featured prominently in both programs, is something of an aerobics session for the eyes. You build up those underused retina muscles by following a tiny white speck as it bounces across your screen. The dot's speed can be set at 100 to 4,000 words per minute.

But both programs also stress the importance of comprehension and retention as well as speed. For instance, some exercises in the Drills section of the *Dynamic Reader* program force you to read a steadily increasing amount of off-screen text in ever shorter periods of time. Other exercises test your ability to use the *Dynamic Reader* recall pattern, a memory-jogging technique.

On-screen readings give you the option of galloping through text either one line at a time through a window or in full-screen displays. If you've been rereading your material, the one-line-at-a-time approach is a welcome option, as it's impossible to backtrack once the text window has flashed by.

Surprisingly, one of the best features of the package is the manual. Unlike many other software manuals, this one is actually enjoyable to read. In fact, it is the backbone of the program, conveying the very essence of the course's techniques and philosophy.

Though I applaud the general design of the program material, it currently suffers from some sloppy hard disk installation instructions, intermittent annoying prompts that ask you to insert a data disk in drive A: when it is already there, and more importantly, key disk copy protection. The company plans to correct these problems in its next release.

But even in this slightly flawed incarnation, *The Evelyn Wood Dynamic Reader* has a lot to offer. After just a couple of weeks of practice, I'm already finding that I'm turning the pages faster and rereading text less often.

List Price: *The Evelyn Wood Dynamic Reader*, $59.95.
Requires: 128K RAM, one disk drive, DOS 2.0 or later. Copy protected. Timeworks Inc., 444 Lake Cook Rd., Deerfield, IL 60015; (800) 323-9755; (312) 948-9200.

CIRCLE **672** ON READER SERVICE CARD

REFERENCE

A Database That Can Save a Trip to the Vet

BY CATHERINE D MILLER

Although you will want to take your cat to the veterinarian at the first sign of illness, you may want to have a veterinary reference at home as well. *Cat-Vet*, by Philip Gale Solutions, is an on-line database of cross-referenced symptoms and ailments and may save you a costly trip to the vet.

Cat-Vet is not a particularly sophisticated program, but it is easy to use and provides a fairly complete veterinary reference on cats. More than 300 symptoms and ailments are cross-referenced in the database. The supportive text for each ailment includes causes, description of symptoms, treatments, possible first aid, prevention tips, and recommendations.

Because the symptoms and ailments are cross-referenced, it's easier to play diagnostician with this program than with a reference book.

List Price: *Cat-Vet*, $49.95.
Requires: 256K RAM, two disk drives, ANSI.SYS device driver, DOS 2.0 or later. Not copy protected. Philip Gale Solutions, P.O. Box 22918, Tucson, AZ 85734; (602) 629-0713.

CIRCLE **670** ON READER SERVICE CARD

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4Z205

AFTER HOURS

GAMES

How to Run for President with a Fund of Only $24.95

BY JARED TAYLOR

Are you tired of slaying dragons in dungeons? Go for the real big time and run for President.

With *President Elect*, from Strategic Simulations, you can step into the ring yourself or manage the campaign of any of 39 real-life Democrats or 28 Republicans. If you want to relive the past, be Nixon in 1960 and try to outfox Kennedy.

President Elect assumes that you've already done the hard part: getting nominated. The game simulates the last 9 weeks before Election Day and takes nine "turns." At the beginning of each week, you get survey results of how different states are leaning. You then decide how to spend your PAPs, or Political Action Points. These are supposed to be a combination of money, flesh pressing, and baby kissing, but you treat them as money.

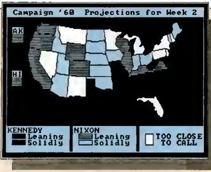
You spend PAPs on national campaigning or by region or state. Here's where strategy matters. If you're running as Jesse Helms, you'll probably carry the South and lose the District of Columbia no matter what, so spend PAPs where they'll make a difference. You can also make whistle-stops, debate your opponent, or make a foreign trip, but there's no way to guess the results.

All this is amusing, but the program only hints at how it's keeping score. I ran a slick campaign against the PC but lost.

President Elect could be good for high school civics classes, because it teaches the importance of money, TV, and electoral votes and the unimportance of experience, honesty, and ability. But it's a good reminder for the rest of us, too.

List Price: *President Elect*, $24.95 **Requires:** 256K RAM, CGA or DOS 2.0 or later. Not copy protected. Strategic Simulations Inc., 1046 N. Rengstorff Ave., Mountain View, CA 94043; (415) 964-1333.

CIRCLE **674** ON READER SERVICE CARD



This map from President Elect *projects voting preferences by state in a simulated replay of the Kennedy-Nixon race of 1960.*

TRAVEL

Highways and Byways: How to Get There From Here

BY JONATHAN MATZKIN

If you know where you're going, but don't know how to get there, fear not. *Highways and Byways*, a routing package from New Directions Software, can help you find your way. The package produces explicit driving instructions for travel between any two U.S. towns with populations over 6,000.

The program is sold in three $49.95 modules, one for each of three U.S. regions, or as a single $129.95 package covering the entire nation.

After you choose your starting point and destination from simple, well-organized menus, *Highways and Byways* constructs a route and displays it as a series of steps in a table.

The table tells you how long each segment of the trip should take and identifies key cities and intersections along the way.

I generated a number of routes with *Highways and Byways*, and all of them would get me quite nicely from point A to point B. But the program doesn't always choose the most efficient or fastest route. When asked for a route between Croton-on-Hudson, N.Y., and West Dover, Vt., *Highways and Byways* responded with a circuitous route via Albany, N.Y.—a trip that would take about 1 hour longer than the approximately 3 hours that the trip has usually taken me.

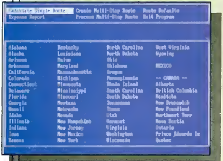
While it is very useful for pleasure trips, *Highways and Byways* has a number of features that will appeal to business users as well. Trips with several stopovers can be entered as a sequence of destinations, and the program will process the entire route in "batch" fashion. The program's expense report generator can help keep track of cost per mile.

But professional users should beware that *Highways and Byways* requires at least an 80286 processor in order to produce results in a reasonably short time. In fairness, though, this shouldn't be of concern to the leisure user getting ready for a vacation.

Highways and Byways is a novel package that should appeal to anyone who drives farther than to the corner store. I'm not sure that it always produces the best route, but it certainly replaces an entire library of U.S. road maps, and you don't have to fold it up when you are finished.

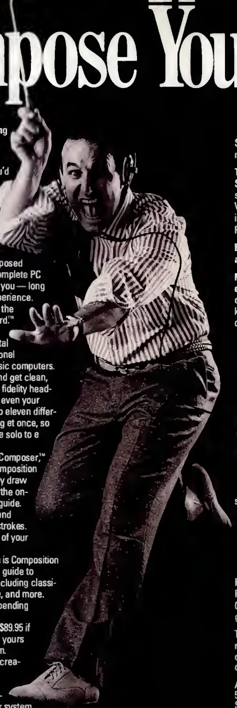
List Price: *Highways and Byways*, national version, $129.95; each of three U.S. regional versions, $49.95. **Requires:** 512K RAM (regional), 640 RAM (national), two disk drives (hard disk recommended), DOS 2.0 or later. Not copy protected. New Directions Software, 5259 Sepulveda Blvd. #9, Van Nuys, CA 91411; (818) 784-9354.

CIRCLE **673** ON READER SERVICE CARD



A Highways and Byways *menu provides you with choices of a starting point and destination. After you pick a state, a submenu offers choices of individual towns.*

Compose Yourself!



Now create superb sounding music on your IBM® PC. Ad Lib™ makes it easy.

Just when you thought you'd heard it all, along comes Ad Lib.

And with it comes rich, room-filling music like you've never heard from a PC before. With rumbling bass, crystal clear highs, up-front mid-range. All of it composed and performed on the first complete PC music system for people like you — long on desire, a little short on experience.

The heart of the system is the Ad Lib Music Synthesizer Card.™ An electronic sound synthesizer based on the same digital technology found in professional keyboards and the finest music computers.

Just plug it into your PC and get clean, powerful music through high fidelity headphones, bookshelf speakers, even your home stereo. It'll handle up to eleven different instrument sounds playing at once, so it's perfect for anything from a solo to a symphony.

There's also Ad Lib Visual Composer,™ about the most instinctive composition software ever devised. Simply draw lines to indicate notes, using the on-screen piano keyboard as a guide. Change instruments, tempo and volume with a couple of keystrokes. Cut, copy and paste portions of your music in a snap.

Included with the program is Composition Projects™#1, a step-by-step guide to creating all kinds of music, including classical, jazz, bossa nova, ragtime, and more. Just the thing for an ever-expanding repertoire.

Visual Composer is worth $89.95 if purchased separately, but it's yours free when you buy the system.

Then play back all of your creations, as well as several pre-programmed selections, on the Juke Box™ playback software, also included with your system.

Look for the Ad Lib Personal Computer Music System™ at selected computer and music stores, or order direct from Ad Lib with your check, Visa or MasterCard.

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Requires IBM PC, XT, AT or compatible, 256K RAM, DOS 2.0 or higher, CGA, EGA or monochrome graphics adaptor.

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PC MAGAZINE AFTER HOURS

EDUCATION

Preparing for B-School Without Books: The Official GMAT Review

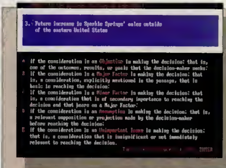
BY EDWARD MENDELSON

It sounds like a shrewd business decision. You or your child has registered to take the Graduate Management Admissions Test, one of the most difficult obstacles to conquer on the road to an MBA and a lucrative career in business. So you buy the review program written by the same organization that writes the test itself. But just how shrewd were you?

The Official Software for GMAT Review ($79.95), available by mail from the Educational Testing Service, includes a 370-page book that you can also buy separately for $9.95. The book includes 500 sample GMAT questions and three complete sample tests, together with explanations of all the answers and worksheets for calculating your score. The questions cover all five categories on the test: problem solving, data sufficiency, reading comprehension, sentence correction, and analysis of situations. The last of these involves questions that ask you to classify different elements of a business problem as objectives, major factors, assumptions, and so forth.

By using the software, you can read on your glowing screen (CGA or EGA required) exactly the same questions you can read on the dull-looking printed page—although you still have to crack the book in order to find the longer passages used in the data sufficiency and reading comprehension sections of the sample tests.

The software also lets you find the answers and read an optional explanation by pressing a few keys rather than flipping pages in the book. And the program uses your computer's clock to time the sample tests, instead of leaving it up to you to look at your watch or set the alarm clock. At the end, the software calculates your score automatically.



```
3. Future increase in Sparkle Springs' sales outside
   of the eastern United States

A  If the consideration is an Objective in making the decision: that is,
   one of the outcomes, results, or goals that the decision-maker seeks:
B  If the consideration is a Major Factor in making the decision: that
   is, a consideration, explicitly mentioned in the passage, that is
   basic in reaching the decision:
C  If the consideration is a Minor Factor in making the decision: that
   is, a consideration that is of secondary importance to reaching the
   decision and that bears on a Major Factor:
D  If the consideration is an Assumption in making the decision: that is,
   a relevant supposition or projection made by the decision-maker
   before reaching the decision:
E  If the consideration is an Unimportant Issue in making the decision:
   that is, a consideration that is insignificant or not immediately
   relevant to reaching the decision.
```

In the analysis of situations section, you first read an essay, then answer questions. GMAT Review *asks questions on passages printed in the book*

Using a computer to review for a test that you will take from a printed booklet is like learning to drive a bus in a BMW. Looking at geometric figures on your color screen is more appealing than reading them in black and white on the printed page—but you won't get the same stimulation when you sit down to take the test. If you use this program to study for the GMAT, you may be preparing yourself for a test that you will never get a chance to take—because the real test requires pencil and paper rather than keyboard and screen.

The bottom line is that using a PC to try the test questions adds nothing to the experience and could even be distracting. Its only advantage is saving you the trouble of calculating your test score.

If you're considering this program as a step toward amassing your family's first fortune, first decide whether you will be $70 closer to your goal if you simply buy the book instead.

List Price: *The Official Software for GMAT Review*, $79.95.

Requires: 256K RAM, two disk drives, CGA or EGA, DOS 2.0 or later. Copy protected. Educational Testing Service, CN 6108, Princeton, NJ 08541; (609) 921-9000.

CIRCLE **675** ON READER SERVICE CARD

What Does It Take to Get into Business School?
Curious whether you have the shrewd mind that business schools are looking for? Here's a sample of problem-solving section questions from *The Official Software for GMAT Review*:

A person bought a ticket to a ball game for $15 and later sold the ticket for $60. What was the percent increase in the price of the ticket?
A. 25 percent; B. 33.3 percent; C. 75 percent; D. 300 percent; E. 400 percent.
A computer routine was developed to generate two numbers (x,y), the first being a random number between 0 and 100 inclusive, and the second being less than or equal to the square root of the first. Each of the following pairs satisfies this routine *except*: A. (99,10); B. (85,9); C. (50,7); D. (1,1); E. (1,0).

The answer to the first is D; to the second, A.

AFTER HOURS INDEX

THE OFFICIAL SOFTWARE FOR GMAT REVIEW
Entrance exam study tool

PRESIDENT ELECT
Run for office or manage your own candidate

HIGHWAYS AND BYWAYS
Directions that'll get you anywhere in the United States

THE EVELYN WOOD DYNAMIC READER
A personal course

TERMINATOR
A global perspective

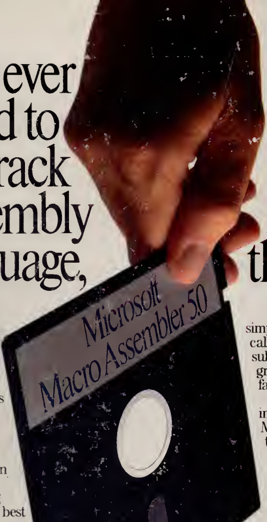
CAT-VET
Save a visit to the vet

VIDEO WIZARD
How to keep home taping under control

YOUR PERSONAL POET
Makes a rhyme in no time

GENIE
An after-hours on-line service

If you ever wanted to take a crack at assembly language, now's the time.



You probably already know that assembly language subroutines are the smartest way to get the fastest programs.

But if the complexities of working in assembler made you think twice, here's some good news. We've made Microsoft® Macro Assembler Version 5.0 a lot easier to use.

We eased the learning process by giving you the best support around. We completely revised our documentation. The new Mixed Language Programming Guide gives you step by step instructions for linking your assembly code with Microsoft QuickBASIC, C, FORTRAN, Pascal and other languages. And you get a comprehensive reference manual with listings of the instruction set and examples of each instruction. We didn't stop there, though. You also get an on-disk collection of templates and examples.

We've also dramatically simplified the high-level language interface. In just a few simple steps, you can be calling Macro Assembler subroutines from programs written in your favorite language.

Now that you're writing the fastest programs, Microsoft is giving you the fastest way to debug them. For the first time, we've added our CodeView® debugger to Macro Assembler.

With source code and comments on your screen, Microsoft CodeView makes debugging programs containing assembly language subroutines a snap.

And you'll be glad to know that you don't sacrifice any speed for all the ease of use.

We took the fastest Macro Assembler on the market and made it even faster.

So what are you waiting for? Get your hands on Microsoft Macro Assembler and see what it's like to break your personal speed limit.

Microsoft®

For more information or for the name of your nearest Microsoft dealer, call (800) 426-9400. In Washington State and Alaska, (206) 882-8088. In Canada, call (416) 673-7638.

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